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NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT

**DEVELOPING A CONCEPTUAL  
METHODOLOGY FOR SUCCESSFUL  
CLEAN DEVELOPMENT MECHANISM (CDM)  
INDUSTRIAL AFFORESTATION /  
REFORESTATION CARBON  
SEQUESTRATION PROJECTS**

**SPECIAL REPORT NO. 05-05  
DECEMBER 2005**

by  
**Savcor Indufor Oy  
Töölönkatu 11 A  
FI-00100 Helsinki, Finland  
Tel: +358 9 684 0110  
Fax: +358 9 135 2552  
indufor@savcor.com  
www.savcor.com**

## **Acknowledgments**

This report was prepared by Savcor Indufor Oy. Eric D. Vance coordinated the project for NCASI.

### **For more information about this research, contact:**

Eric D. Vance, Ph.D.  
NCASI  
P.O. Box 13318  
Research Triangle Park, NC 27709-3318  
(919) 941-6415  
evance@ncasi.org

Reid Miner  
Vice President, Sustainable Manufacturing  
NCASI  
P.O. Box 13318  
Research Triangle Park, NC 27709-3318  
(919) 941-6407  
rminer@ncasi.org

### **For information about NCASI publications, contact:**

Publications Coordinator  
NCASI  
P.O. Box 13318  
Research Triangle Park, NC 27709-3318  
(919) 941-6400  
publications@ncasi.org

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## **PRESIDENT'S NOTE**

The Kyoto Protocol's Clean Development Mechanism (CDM) is one of three "mechanisms" designed to help participating countries meet their emission reduction obligations under the Protocol. The CDM provides an incentive in the form of Certifiable Emission Reductions (CERs) for countries or companies to invest in greenhouse gas reduction projects, including certain types of forest carbon sequestration projects, in eligible developing countries. The CERs can be purchased by Kyoto signatories to help them meet and reduce costs associated with their emission reduction targets. Unlike other Kyoto mechanisms, CDM projects must also contribute to the sustainable development of host developing "non-Annex 1" countries.

Forest product companies could potentially benefit from the CDM program by investing in Afforestation or Reforestation (A/R) projects and collecting CERs that they can sell. There are concerns, however, that none of the 13 A/R projects proposed to the CDM Board have yet been approved. There are also questions about whether industrial forest projects with financial benefits other than from the sale of CERs will be eligible for the program. Information on CDM A/R project characteristics and design options required for approval by the Board is needed to help companies decide whether to incur the risks and costs of planning and developing such projects.

Due to the potential opportunities presented by the CDM and questions about whether and how industrial forest projects may be eligible, a group of global forest products companies asked NCASI to organize an effort to (a) review A/R projects proposed to the CDM Executive Board in the past, (b) evaluate why proposed projects have been rejected by the Board, and (c) identify criteria for implementing successful industrial forestry CDM A/R projects. NCASI, together with a working group of member companies, chose Savcor Indufor Oy, a Finnish firm, to conduct this review and evaluation. The review was sponsored by five NCASI member companies: International Paper, Stora Enso, Weyerhaeuser, MeadWestvaco, and Temple-Inland.

This report contains the results of Savcor Indufor's review. It reviews A/R project proposals to the CDM Board and documents reasons for their rejection. Under the constraints of the current CDM A/R criteria, a concept plan for an industrial CDM A/R project is also described. This report should provide a valuable resource for companies to use in deciding whether to develop their own CDM A/R project.

A handwritten signature in black ink, appearing to read "Ron Yeske", is located below the main text.

Ronald A. Yeske

December 2005



**DEVELOPING A CONCEPTUAL METHODOLOGY FOR  
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**ABSTRACT**

The Clean Development Mechanism (CDM) is one of three Kyoto Protocol “flexibility mechanisms” designed to assist participating Parties comply with their emission reduction commitments while advancing sustainable development of host countries. The eligibility of land-use, land-use change and forestry project activities under the CDM provides an opportunity for industries to invest in afforestation or reforestation (A/R) projects that sequester carbon and meet requirements of providing economic development and conservation benefits for the host country.

Although A/R projects are an eligible component of the CDM, none have yet been approved by the CDM Executive Board. The objectives of this report are to (a) review A/R projects proposed to the CDM Executive Board in the past, (b) evaluate the reasons why proposed projects have been rejected by the Board, and (c) identify criteria for implementing successful, sustainably managed industrial forestry projects. These criteria include project design, host country selection, approaches for overcoming additionality and leakage constraints, and the role of conservation and economic objectives.

This report, prepared by Savcor Indufor Oy of Finland, reviews CDM A/R project criteria and summarizes each of 13 proposed CDM A/R projects. Criteria responsible for the rejection of each project by the CDM Executive Board were evaluated. The primary reason for project rejection was found to be inadequate documentation and/or quantification of baseline scenarios and additionality, meaning that project proposers did not provide sufficient evidence that the reductions accomplished by the project were additional to what would be done in the absence of the project. Many of the projects appear to have been rejected because they failed the “investment analysis” by being financially viable without carbon credits, an aspect of additionality that remains controversial. Another important conclusion from the review is that while strong economic development and environmental components are critical CDM A/R criteria, meeting these criteria do not compensate for a failure to meet additionality requirements.

Under the constraints imposed the current CDM A/R criteria, a concept for an industrial CDM A/R methodology is illustrated. The concept is based on increased mill production capacity resulting from an expanded area of wood procurement that becomes economically feasible when carbon credits are considered. Other characteristics of the industrial project concept include (a) local community participation in ownership and management, (b) a social development program to improve local infrastructure, education, and training, and (c) natural forest restoration to enhance carbon sequestration and biodiversity.

**KEYWORDS**

Carbon sequestration, Clean Development Mechanism, CDM, climate change, greenhouse gases, Kyoto Protocol



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## ABBREVIATIONS AND ACRONYMS

|                    |   |
|--------------------|---|
| %                  | percent   |
| A/R                | Afforestation/Reforestation                             |
| C/B                | Cost / Benefit  |
| CDM                | Clean Mechanisms Development                            |
| CER                | Certified Emission Reductions                           |
| CH <sub>4</sub>    | methane   |
| CO <sub>2</sub>    | carbon dioxide  |
| CO <sub>2</sub> -e | carbon dioxide equivalent                               |
| CP                 | Conference of The Parties                               |
| EB                 | Executive Board   |
| FAO                | Food and Agriculture Organization of the United Nations |
| FR                 | Kikonda Forest Reserve                                  |
| FSC                | Forest Stewardship Council                              |
| GHG                | Greenhouse Gas  |
| GPS                | Global Positioning System                               |
| g-w                | Global-woods AG   |
| ha                 | hectare   |
| IET                | International Emission Trading                          |
| IPCC               | Intergovernmental Panel on Climate Change               |
| IRR                | Internal Rate of Return                                 |
| JI                 | Joint Implementation                                    |
| kg                 | kilogram  |
| ICER               | Long-term certified emission reduction                  |
| LULUCF             | Land Use, Land Use Change and Forestry                  |
| MPR                | Mountain Pine Ridge                                     |
| N <sub>2</sub> O   | nitrous oxide   |
| NCASI              | National Council for Air and Stream Improvement         |
| NEMA               | National Environment Management Authority               |
| NFA                | National Forestry Authority                             |
| NGO                | non-governmental organisation                           |
| NMB                | New Methodology Baseline                                |
| NMM                | New Monitoring Methodology                              |
| NPV                | Net Present Value                                       |
| PDD                | Project Design Document                                 |
| t                  | tonne   |
| UN                 | United Nations  |
| UNFCCC             | United Nations Framework Convention on Climate Change   |
| USD                | United States Dollar                                    |
| WG                 | Working Group   |
| yr                 | year  |



# **DEVELOPING A CONCEPTUAL METHODOLOGY FOR SUCCESSFUL CLEAN DEVELOPMENT MECHANISM (CDM) INDUSTRIAL AFFORESTATION / REFORESTATION CARBON SEQUESTRATION PROJECTS**

## **EXECUTIVE SUMMARY**

### ***Objective and Qualification Criteria for CDM A/R Projects***

The objective of this report is to review Afforestation/Reforestation (A/R) projects proposed to the Clean Development Mechanism Executive Board (CDM EB) and identify criteria for implementing successful industrial CDM A/R projects. An A/R project eligible to CDM shall meet all the relevant requirements defined by the CDM EB. The main requirements relate to (a) definition of baseline scenarios without the project, (b) additionality in sequestered carbon stocks due to the application of the CDM modality, (c) monitoring of the development of carbon stocks, (d) leakage in terms of carbon dioxide removals outside the project boundaries, and (e) environmental and socio-economic impacts of the project.

### ***Review of Proposed CDM A/R Projects***

The review of proposed CDM A/R projects has revealed that the main obstacles for getting an A/R project approved by CDM EB consist of failures to comply with the requirements concerning (i) baseline methodology, and (ii) demonstration of additionality. More elaborated baseline scenarios that are built on scientific and economic analysis would have provided a sound basis for the demonstration of additionality and consequently acceptability of the proposed projects. As a result of the inadequate project documentation, the CDM EB has not approved a single project, baseline or monitoring methodology so far.

Environmental and socio-economical benefits do not compensate deficiencies in methodologies for baseline assessment or demonstration of additionality. Also, the project must be economically attractive only when additional income from Certified Emission Reductions (CERs) is considered.

### ***Concept for a Successful CDM A/R Project***

The concept for a successful CDM A/R project relies on the selection of A/R sites that consist of abandoned agricultural fields, pastures or other areas, which are currently not in active use. It would be beneficial to the A/R project if the host country were not experienced in industrial tree plantations. This starting point would allow the use of the argument “first of its kind”, which is an exploitable impediment type under the barriers due to prevailing practice (ref. Tool for Demonstration and Assessment of Additionality in CDM A/R Project Activities).

The project’s additionality will be demonstrated by *i) investment analysis* and by *ii) barrier analysis*. The barrier analysis will complement the investment analysis to prove the non-feasibility of the A/R project without the expected CDM incentives. Since the barriers are always country/region specific, they need to be identified case by case (barriers are always closely interlinked with the baseline scenarios).

The investment analysis is based on the financial fact that tree plantations located near a mill are able to provide wood raw material at a competitive cost/price for industrial purposes. Plantations outside a certain radius from the mill are not attractive raw material sources because of the high transportation costs and other expenses due to the physical distance. With the help of the benefits from CDM project, however, the mill is able expand its production capacity and wood procurement area.

In addition to the plantations with the purpose of producing industrial wood raw material, the project concept is recommended to include forest stands aiming to enhance biodiversity and restore natural forest formations in the region. The restored natural forests will not be harvested and therefore the carbon sequestered in them can be considered as tradable Certified Emission Reductions.

The proposed concept also draws on participation of local community in the ownership and management of the planted areas. A separately agreed share of the plantations is recommended to consist of private tree farms that are technically and financially supported by the project developer.

***Specific Risk Related to Acceptability of Industrial CDM A/R Projects***

The risk that A/R CDM methodologies for industrial fast growing plantations are considered non-acceptable is relatively high. The industrial A/R activities are generally opposed because they are commonly considered financially attractive and thus unable to meet the additionality provision of CDM projects. Therefore it is crucial that the project developer is prepared for criticism and able to provide credible evidence concerning the additionality of the proposed A/R project.

# DEVELOPING A CONCEPTUAL METHODOLOGY FOR SUCCESSFUL CLEAN MECHANISMS DEVELOPMENT (CDM) INDUSTRIAL AFFORESTATION / REFORESTATION CARBON SEQUESTRATION PROJECT

## 1.0 INTRODUCTION

The Kyoto Protocol has introduced three mechanisms for flexible reduction of Greenhouse Gas (GHG) emissions: the Clean Development Mechanism (CDM), Joint Implementation (JI) and International Emission Trading (IET). CDM is a project-based activity between Annex B (~industrialized) and non-Annex B (~developing) countries. CDM projects shall

- produce human-induced emission reductions / GHG removals
- be additional
- produce real, measurable, long-term carbon dioxide (CO<sub>2</sub>) reductions, and
- support sustainable development

The Kyoto Protocol acknowledges forest carbon sinks by Afforestation and Reforestation (A/R) activities in the abatement against global warming. CDM and JI projects can also be based on A/R activities. However, the CDM Executive Board (CDM EB) has not yet approved any A/R project methodology. The CDM EB has been widely criticized for taking a very strict approach on interpreting the CDM rules and thus slowing down approvals of all types of projects for GHG reduction. In early 2005, the CDM EB has clearly shortened the evaluation time of submitted methodologies.

A group of global forest industry companies has asked the National Council for Air and Stream Improvement (NCASI) to solicit consulting organizations for proposals to assess possibilities for defining and implementing CDM A/R methodologies for industrial forest plantations. The project is divided into a *concept phase* and an *implementation phase*. This report relates to the concept phase, in which a conceptual methodology and criteria for implementing successful industrial CDM A/R projects are outlined.

## 2.0 OBJECTIVE

In accordance with the NCASI request for proposals, the objective of this consultancy assignment is to develop *the concept phase* of the project. *The concept phase* is defined to include:

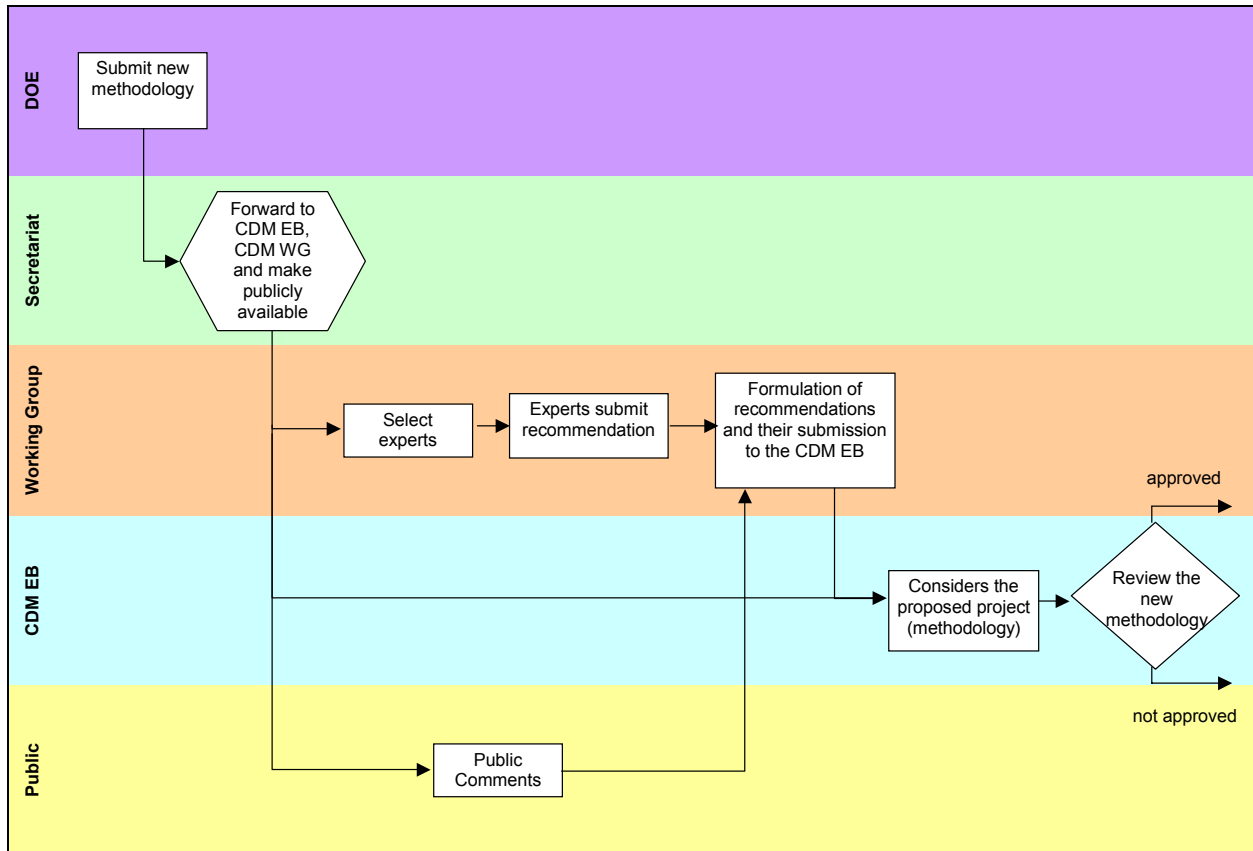
- (a) a review of A/R projects proposed to the CDM EB in the past.
- (b) an evaluation of why proposed projects have been rejected by the CDM EB.
- (c) the identification of criteria for implementing successful sustainably managed industrial forestry projects, including project design, host country selection, approaches for overcoming additionality and leakage constraints, and the role of conservation and economic objectives.

A special emphasis is placed on the importance of additionality as a primary constraint to the acceptance of CDM A/R projects by the CDM EB. This includes a more detailed account of the different types of additionality constraints impeding acceptance of past projects and traditional and novel ways of overcoming these hurdles, such as (a) altering design elements inherent to the core project itself, and (b) adding conservation and economic development components to increase the attractiveness of the project to the CDM EB and host country.

### 3.0 EVALUATION OF CDM AFFORESTATION/REFORESTATION PROJECTS

#### 3.1 EVALUATION PROCESS

The CDM EB regulates strictly the CDM project cycle (Figure 3.1). Proposed projects need first to get approval for their baseline methodology and monitoring methodology. After the methodologies have been approved, the project developers need to get the actual Project Design Document (PDD) approved and registered. Then proposed project shall be validated by a CDM EB-accredited operational entity. Based on the validation report, Certified Emission Reductions (CERs) can be issued.



**Figure 3.1** Evaluation of CDM Methodologies

A total of 145 methodologies, of which 13 are based on A/R activities, have been submitted to CDM EB for approval as of October 2005. The results of the evaluation process are summarized below:

- 25 methodologies (of which no A/R) have been approved
- 6 consolidated methodologies have been approved
- 29 projects have been approved and registered by the CDM EB
- no A/R projects have been submitted for registration



The CDM EB has established a special working group on A/R issues to provide guidance on carbon sink projects. The A/R Working Group's tasks are:

1. Prepare recommendations on submitted proposals for new baseline and monitoring methodologies for CDM A/R project activities
2. Prepare draft revised versions of proposed new baseline and monitoring methodologies for CDM A/R projects
3. Prepare recommendations on options for expanding the applicability of methodologies for CDM A/R project activities and develop tools to facilitate the selection of applicable methodology
4. Propose precise and workable recommendations for consideration and adoption by the CDM EB on:
  - Development and revisions of the project design document for the proposed CDM A/R project activities, in particular on those sections relevant to baseline and monitoring
  - Structural guidance and tools to select the most appropriate and efficient methodologies.

In particular, the demonstration of the additionality provision in CDM and JI projects has been very difficult for the project planners and therefore the A/R Working Group has prepared a draft tool for assessing the additionality in A/R projects. The Tool for the Demonstration and Assessment of Additionality in A/R CDM Project Activities proposes a stepwise approach, including (Figure 3.2):

1. Preliminary screening for eligibility
2. Identification of alternatives to A/R project activity (possible baselines)
3. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive\*, **or**
4. Barriers analysis
5. Impact of registration of the proposed A/R project activity as a CDM project activity

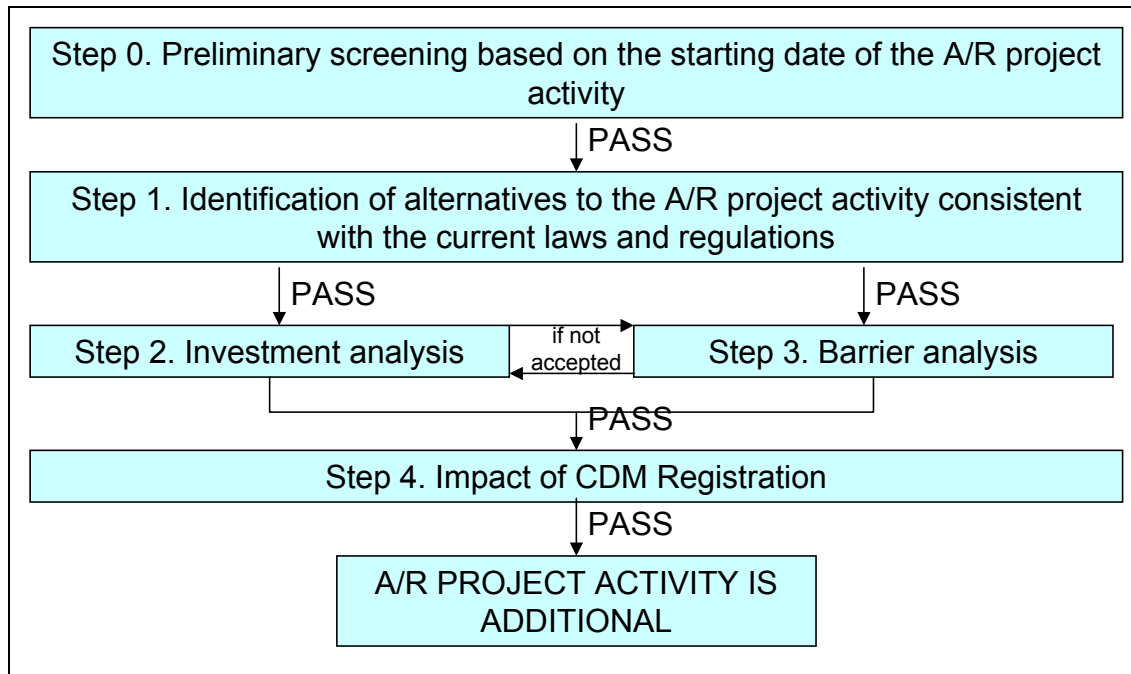
The Tool for Demonstration and Assessment of Additionality in A/R CDM Project Activities gives voluntary recommendations for preparation of Project Design Documents (PDD). However, conformity to these recommendations has been practically a preconditions for approval of any A/R methodology.

Other relevant guiding documents include:

- Guidelines for completing the Project Design Document (CDM-AR-PDD), New Methodology Baseline (CDM-AR-NMB) and New Monitoring Methodology (CDM-AR-NMM)
- CDM Glossary
- CDM Modalities and Procedures for A/R Methodologies

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\* This element conflicts with the Marrakesh Conference of the Parties decision.



**Figure 3.2** Additionality Test

## 3.2 EVALUATION CRITERIA

### 3.2.1 Selection of Key Criteria

The review of the A/R project proposals submitted to CDM EB and the evaluation of the reasons for their rejection are based on a set of criteria selected adapted from the Additionality test defined in the CDM guiding documentation. The selected elements of the Additionality test include requirements on the following provisions for CDM projects:

1. Eligibility
2. Baseline
3. Monitoring
4. Additionality (investment and barrier analysis)
5. Leakage
6. Environmental and Socio-economic impacts

The requirements are discussed in more detail in Sections 3.2.2-3.2.7 of this report.

### 3.2.2 Preliminary Screening

Preliminary Screening is the Step 0 in the additionality test.

#### ***Eligibility***

To provide evidence that the land within the planned project boundary is eligible for A/R CDM project, the project participant shall demonstrate that the land cover within project boundary was not forested in December 1989.

The eligibility of land for A/R CDM project activity may be demonstrated using (a) aerial photographs or satellite imagery; or (b) ground based surveys (land use permits, land use plans or

information from local registers such as cadastre, owners register, land use or land management register); or (c) if options (a) and (b) are not available/applicable, project participants shall submit a written testimony.

If the project is already started, the project participant shall provide evidence that the starting date of the A/R CDM project activity falls between 1 January 2000 and the date of the registration of a first A/R CDM project.

***Additional objects of preliminary screening***

Project participants shall also provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project planning. This evidence shall be based on documentation (preferably official, legal and/or other corporate) that was available to third parties at, or prior to, the start of the project activity.

Provide evidence that the project activity is directly human-induced (e.g. through planting, seeding and/or the human-induced promotion of natural seed sources or root stocks) and not a mere continuation of the pre-project spontaneous processes.

**3.2.3 Baseline**

The CDM EB has defined the baseline scenario for an A/R CDM project activity as “*The scenario that reasonably represents the sum of the changes in carbon stocks in the carbon pools within the project boundary that would occur in the absence of the A/R CDM project activity.*” This scenario shall be derived using a baseline methodology referred to in paragraphs 12 and 13 of the CDM A/R modalities and procedures. Definition of the baseline is Step 1 in Additionality Test.

***Conceptual basis***

A baseline shall cover all carbon pools<sup>†</sup> within the project boundary but project participants may choose not to account for one or more carbon pools. In this case they shall provide transparent and verifiable evidence indicating that the exclusion of any pool from the monitoring of GHG removals and emissions shall not result in biased estimates for net anthropogenic GHG removals by sinks. The risk to ignore a significant GHG source related to an excluded carbon pool shall be eliminated.

The baseline methodology shall produce credible scenarios on the future development of proposed project area where project activities are not implemented. The baseline methodology may rely on any of the listed below approaches. The PDD shall take into account any guidance given by the CDM EB, and justify the appropriateness of their chosen approach.

- (a) Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary;
- (b) Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment;
- (c) Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts.

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<sup>†</sup> Carbon pools are: above-ground biomass, belowground biomass, litter, deadwood and soil organic carbon.

### **Definition**

The aspects to be considered in the identification of alternatives to the A/R project activity (the possible baselines) include:

1. Identification of realistic and credible land-use alternative(s) available to the project participants or similar project developers. These alternatives are to include:
  - The proposed project activity is undertaken as a normal project activity without A/R CDM registration.
  - Other plausible and credible land-use alternatives to the project activity deemed appropriate with respect to location, size, funds/expertise requirements, etc. These may include economically feasible alternatives taking into account barriers to investment or the most likely land-use at the time the project starts, as well as common land-use practices applied in region where the proposed project is located.
  - Continuation of the current situation (no project activity or other alternatives undertaken) or reverting to the historical situation.
2. The baseline alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than land-use and related regulations (e.g., conservation of biodiversity, soil and water protection, tax and investment regulations, mitigation of air pollution).
  - If an alternative does not comply with all applicable legislation and regulations, project participant shall provide evidence that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that noncompliance with those requirements is widespread in the country or administrative unit. If this cannot be proven, the alternative should not be considered as an optional baseline.
  - If the proposed project activity is the only alternative amongst the ones considered by the project participants that is in compliance with all regulations with which there is general compliance, then the proposed A/R CDM project activity is not additional.

#### **3.2.4 Additionality**

According to CDM EB: “*An afforestation or reforestation project activity under the CDM is additional if the actual net greenhouse gas removals by sinks are increased above the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the registered CDM afforestation or reforestation project activity.*”

The actual net greenhouse gas removals by sinks represent the removals occurring within the project boundary when removals of the baseline scenario and emissions in leakages are taken into consideration. The actual net greenhouse gas removals by sinks is defined as the sum of the verifiable changes in carbon stocks in the carbon pools within the project boundary, subtracting the increase in emissions of the GHGs measured in CO<sub>2</sub> equivalents (CO<sub>2</sub>-e) due to the implementation of the A/R project.

Credits are issued for the “net anthropogenic greenhouse gas removals by sinks,” which is calculated by subtracting the baseline net GHG removals by sinks and leakage from the actual net GHG removals by sinks.

Actual net GHG removals - BL net GHG removals - leakage = net anthropogenic GHG removals.

CDM EB Tools for the assessment of additional impacts of project activities on GHG removals and emissions include:

- investment analysis to determine that the proposed project activity is not the most economically or financially attractive;
- barriers analysis to detect any other barriers preventing implementation of the project as normal activity; and
- impact of registration of the proposed afforestation or reforestation (A/R) project activity as an A/R CDM project activity.

### ***Investment analysis (step 1)***

The investment analysis shall indicate that the CDM project activities are not economically profitable and feasible without funding from carbon credits. Recommended methods for investment analysis include the following options:

- Option I. Apply simple cost analysis
- Option II. Apply investment comparison analysis (Internal Rate of Return (IRR), Net Present Value (NPV) or Cost/Benefit ratio)
- Option III. Apply benchmark analysis
- Sensitivity analysis

### ***Barriers analysis (step 2)***

Different types of barriers may hinder implementation of planned project activities as normal business or development activities. If project participants can provide credible evidence that any of the following type of barriers can be removed if project is registered as CDM A/R Methodology and receives carbon credits, an aspect of additionality is accomplished.

#### **1. Investment barriers, other than the economic/financial barriers:**

- Debt funding is not available for this type of project activity
- No access to international capital markets due to real or perceived risks associated with domestic or foreign direct investment in the country where the project activity is to be implemented
- Lack of access to credit

#### **2. Institutional barriers:**

- Risk related to changes in government policies or laws
- Lack of enforcement of forest or land-use-related legislation

#### **3. Technological barriers:**

- Lack of access to planting materials
- Lack of infrastructure for implementation of the technology

**4. Barriers related to local tradition:**

- Traditional knowledge or lack thereof, laws and customs, market conditions, practices
- Traditional equipment and technology

**5. Barriers due to prevailing practice:**

- The project activity is the “first of its kind”: No project activity of this type is currently operational in the host country or region

**6. Barriers due to local ecological conditions:**

- Degraded soil (e.g. water/wind erosion, salination, etc.)
- Catastrophic natural and / or human-induced events (e.g., land slides, fire, etc)
- Unfavourable meteorological conditions (e.g., early/late frost, drought)
- Pervasive opportunistic species preventing regeneration of trees (e.g., weeds and grasses; for example, alang-alang in Indonesia)
- Unfavourable course of ecological succession
- Biotic pressure in terms of grazing, fodder collection, etc.

**7. Barriers due to social conditions:**

- Demographic pressure on the land (e.g., increased demand on land due to population growth)
- Social conflict among interest groups in the region where the project takes place
- Widespread illegal practices (e.g., illegal grazing, non-timber product extraction and tree felling)
- Lack of skilled and/or properly trained labour force
- Lack of organisation of local communities

***Impact of CDM registration (step 3)***

The assessment explains how the approval and registration of the project activity as an A/R CDM project activity, and the attendant benefits and incentives derived from this registration, will alleviate the economic and financial hurdles or other identified barriers and thus enable the project activity to be undertaken.

**3.2.5 Monitoring Methodology**

Monitoring refers to the collection and archiving of relevant data for estimating or measuring the net anthropogenic GHG removals by sinks during the crediting period. Credible monitoring methodologies for GHG removals and emissions, and meeting of baseline, additionality and leakage criteria on the project site are crucial elements in the assessment of proposed CDM A/R methodologies. Monitoring should be done, as appropriate, by sinks and sources covering all selected carbon pool.

The following items should be included in the monitoring plan:

1. Techniques and methods for sampling and measuring individual carbon pools and greenhouse gas emissions by sources used to calculate net greenhouse gas removals by sinks. Methods should reflect commonly accepted principles and criteria concerning forest inventory;
2. The collection of all relevant data necessary for determining the baseline net greenhouse gas removals by sinks during the crediting period. If the project uses control plots for determining

- the baseline, the monitoring plan shall specify techniques and methods for sampling and measuring individual carbon pools and greenhouse gas emissions by sources;
3. The identification and monitoring of all potential sources of leakage during the crediting period;
  4. The collection and archiving of information relating to the planned monitoring and remedial measures
  5. Collection of transparent and verifiable information to demonstrate that any choice made does not increase the net anthropogenic greenhouse gas removals by sinks;
  6. Changes in circumstances within the project boundary that affect legal title to the land or rights of access to the carbon pools;
  7. Quality assurance and control procedures for the monitoring process;
  8. Procedures for the periodic calculation of the net anthropogenic greenhouse gas removals by sinks due to the afforestation or reforestation project activity. Documentation of all steps involved in those calculations, and measurement to implement activities and minimize leakage.

### 3.2.6 Leakage

Leakage is “*the increase in GHG emissions by sources which occurs outside the boundary of an A/R CDM project activity which is measurable and attributable to the A/R CDM project activity.*”

The term “positive leakage” is also used. CDM EB defines it as “*increase in GHG removals by sources outside the boundary of an A/R CDM project activity*”. According to Decision 19/CP.9<sup>‡</sup> this kind of leakage shall not be accounted for in projects.

### 3.2.7 Environmental and Socio-economic Impacts

The objective in the assessment of environmental and social impacts is to ensure that CDM A/R project activities do not have adverse impacts on environment and social conditions. Positive impacts, as such, are not adequate merit for project approval if requirements (e.g., on Additionality test) are not met.

Project participants must provide an analysis of the socio-economic and environmental impacts of the project. If the project has significant negative impacts, the participants must include a statement that they have undertaken a socio-economic and/or environmental impact assessment in accordance with the procedures required by the host country.

An analysis of socio-economic and environmental impacts should include:

- Environmental: information on hydrology, soils, risks of fire, pests and diseases, etc.
- Socio-economic: information on local communities, indigenous peoples, land tenure, local employment, food production, cultural and religious sites, access to fuel wood and other forest products.

Participants are also required to make provisions for monitoring these impacts and take remedial measures for any negative socio-economic and environmental impacts identified.

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<sup>‡</sup> CP.9 is The Conference of The Parties on its Ninth Session, held in Milan from December 1-12, 2003.

## 4.0 REVIEW OF A/R METHODOLOGIES PROPOSED TO CDM EXECUTIVE BOARD

### 4.1 OVERVIEW

A total of thirteen project proposals on A/R methods have been submitted to CDM EB for approval (Table 4.1). The A&R Working Group has evaluated the first eleven project proposals and concluded that the methodologies in nine of them did not fulfill the CDM criteria. Consequently CDM EB did not approve any these projects. The A/R Working Group has made preliminary recommendations to the CDM EB to approve the project on reforestation of Guangxi watershed area in China (ARNM 0010) and to give further consideration to the Moldova soil conservation project proposal (ARNM 0007). Proposals for the A/R project on unmanaged grassland, Brazil (ARNM 0012) and Mountain pine ridge reforestation (ARNM 0013) project are under review by the A/R WG without recommendations at this point. The former project has already been rejected once by the CDM EB (under proposal number ARNM 0002) and latter twice (under proposal numbers ARNM 0001 and 0005) but these proposals have been revised and resubmitted for approval.

A summary of the key requirements all CDM A/R projects shall fulfill is presented in Box 4.1.

#### **Eligibility**

- The area was non-forested in 1989 and has not regenerated naturally since.

#### **Baseline**

- Scenario on the economic, social and ecological development of project area without any project activities.
- Scenario projected to cover the project schedule (e.g. rotation time).

#### **Additionality**

- Investment analysis demonstrates that the project would not have been financed without CDM funding.
- Barrier analysis identifies physical or functional barriers to be overcome with successful project implementation.

#### **Ecological and socio-economic impacts**

- Project should not have adverse impacts on forest ecosystems or socio-economic conditions.

**Box 4.1** CDM A/R Project Key Requirements

### 4.2 REVIEW OF PROPOSED PROJECTS

In the following chapters, the project proposals are evaluated in view of the CDM criteria. The evaluation is based on project documents and comments provided by A/R Working Group and its desk reviewers (Table 4.1). Potential reasons for not meeting CDM criteria are identified.

#### 4.2.1 Mountain Pine Ridge Reforestation Project, Belize (ARNM 0001, 0005, 0013)

The proposal for this project has been rejected twice (ARNM 0001, 0005), but has been revised and resubmitted for approval. The last proposal (ARNM 0013) is under review by the A/R WG. Because of the similarity of the proposals, the project is reviewed and evaluated only once in this report.



**Table 4.1 A/R Methodologies Submitted to CDM EB**

| No | A | Project  | Baseline Methodology   | Monitoring Methodology   | Country  | Sponsor                       |
|----|---|--|--|--|----------|-------------------------------|
| 1  | R | Mountain pine ridge reforestation project  | Plantation establishment and management in fire ecosystem  | Plantation monitoring through systematic plotting  | Belize   | Brinkman & Ass. Ltd. (Canada) |
| 2  | R | Reforestation project using native species around AES-Tiete Reservoirs             | Reforestation of grasslands with native species  | Reforestation of grasslands with native species  | Brazil   | -                             |
| 3  | R | International small group & tree planting program                                  | Simplified baseline methodology for smallholder A&R projects in areas undergoing continued deforestation                           | Monitoring afforestation/reforestation by small groups or individuals  | Tanzania | WB BioCarbon Fund             |
| 4  | R | “Treinta y Tres” afforestation combined with livestock intensification             | Afforestation on grassland sites, combined with livestock intensification  | Afforestation on grassland sites, combined with livestock intensification and conservation of native forests     | Uruguay  | -                             |
| 5  | R | Mountain pine ridge reforestation project (re-submitted)                           | Plantation forestry with baseline control  | Plantation forestry with baseline control  | Belize   | Brinkman & Ass. Ltd. (Canada) |
| 6  | R | Bagepalli CDM afforestation programme  | Simplified baseline methodology for small-scale CDM afforestation/reforestation on degraded lands, grasslands and fallow croplands | Afforestation/reforestation on degraded lands, grasslands and fallow croplands                                   | India    | -                             |
| 7  | c | Moldova soil conservation project  | Restoration of degraded lands through afforestation/reforestation  | Restoration of degraded lands through afforestation/reforestation  | Moldova  | WB PCF                        |
| 8  | R | Kikonda forest reserve reforestation project                                       | Afforestation and reforestation of degraded bush and woodlands in forest reserve areas   | Monitoring reforestation of degraded bush and woodlands in forest reserve areas                                  | Uganda   | Global-woods AG (Germany)     |
| 9  | R | Rio Aquidaban reforestation project  | Reforestation of degraded bush and grassland   | Monitoring methodology for reforestation of degraded bush and grassland  | Paraguay | Global-woods AG (Germany)     |
| 10 | a | Facilitating reforestation for Guangxi watershed management in Pearl river basin   | Reforestation of degraded land   | Monitoring methodology for reforestation of degraded land  | China    | WB BioCarbon Fund             |
| 11 | R | Chocó-Manabi corridor reforestation and conservation carbon project                | Afforestation and reforestation project activities that are additional due to financial barriers to their implementation           | Monitoring methodology for afforestation or reforestation project activities                                     | Ecuador  | Ricoh Ltd. (Japan)            |
| 12 | e | Afforestation or reforestation project activity implemented on unmanaged grassland | Baseline methodology for afforestation and reforestation project activities implemented on unmanaged grassland                     | Monitoring methodology for afforestation and reforestation project activities implemented on unmanaged grassland | Brazil   |                               |
| 13 | e | The Mountain Pine Ridge Reforestation Project (re-submitted)                       | Afforestation/reforestation with baseline control areas  | Afforestation/reforestation with baseline control areas  | Belize   | Brinkman & Ass. Ltd. (Canada) |

A Status of approval

R Rejected by CDM EB

a Recommended for approval by A/R WG

c

Further considered by A/R WG

e

Under evaluation by A/R WG

### ***General description***

The project aims at reforestation and protection of a portion of the Mountain Pine Ridge Forest Reserve in Belize. The objective is to establish forests of the native species *Pinus caribaea* that would provide a sustainable forest resource for carbon sequestration, timber production, habitat protection and enhance socio-economic stability in the region.

The project area is 8 707 hectares, of which close to 7 000 hectares are forest land and 1 700 hectares grassland. The pine forest in the area was totally destroyed by bark beetle attacks in 2000. The untended, extremely dense pine forest was **susceptible** to the large-scale damage.

The natural pine forest used to be an important source of revenue to the Government of Belize that invested in fire and biodiversity protection in the area. The area was also an important tourist attraction and a significant source of employment.

Due to site conditions and frequent fires natural reforestation will not occur in the area.

### ***Baseline***

The baseline of the project consists of the following development patterns:

- The area is subject to frequent fire disturbance under unmanaged conditions, leading to a degrading savannah ecosystem.
- The area is too poor for agricultural use and would be used for low intensity cattle grazing that will most likely further degrade the area.
- The timber production capacity of the area (low production yield and long rotation times) is not adequate for economically viable timber production without additional compensation from CDM methodologies.

The project proposal covers the carbon pools of (i) above and (ii) below ground biomass and monitors the sequestration and emission of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxid (N<sub>2</sub>O).

### ***Additionality***

The additionality analysis is based on economic modeling to determine the **IRR** of alternate land use scenarios with and without CDM approval (registration), and to identify economic barriers to implementation.

### ***Monitoring***

The monitoring methods are based on a standard **biomass** yield measurement in plantation forestry. The proposed monitoring methods will deliver statistically reliable data on **biomass** in tree, shrub and grass layers in a managed plantation, and on **GHG** emissions within the project area caused by project activities. The monitoring methodology is cost efficient and yields data and estimates for changes in carbon pools and GHG emissions. However, monitoring methods do not take into consideration the fire risk and its implications to GHG sequestration and emissions.

### ***Leakage***

The two primary sources of leakage are forest fires and **timber harvesting**. Fire control is a critical element in ensuring the continuity of carbon sequestration within the project area. Strategies to prevent leakage include (i) maximizing the use of natural fire breaks outside the project area, and (ii) compensating open fire-breaks with additional planting.

***Environmental impacts***

The project is a restoration activity designed to ameliorate the damages of the pine beetle infestation. The current environmental conditions of the MPR area are far from the ecological equilibria. Recent studies indicate that bird populations have decreased and erosion increased since 2000.

The proposed project activity will not restore the natural savannah ecosystem which existed there prior to the 1950s when the fire control regime started. However, it will restore a critical ecosystem component to the area. Because only a portion of the area will be planted, the project will result in a mix of dense pine areas within a larger grass-dominated ecosystem. This mix will be more similar to the natural savannah than either the uniform dense pine forest under fire control, or the dead pine forest since the bark beetle outbreak.

The project will have positive ecological impacts by increasing habitats for a number of pine-dependent species without eliminating habitat for species requiring more open, fire dominated ecosystems. The project also prevents soil erosion and improves water protection in the area. The changes in the hydrograph from the area are expected to positively impact the hydro-electric project currently under way on the river, which forms the southern border of the area. The planned activities are fully supported by the Government of Belize and will meet all national environmental regulations.

***Socioeconomic impacts***

The Socioeconomic impacts are not assessed in the Project Design Document.

**Eligibility**

- The Mountain Pine Ridge Reforestation Project does not meet the eligibility criteria, because the area was forested in 1989.

**Baseline**

- The baseline scenario does not predict the alternative development trends but relies on the continuation of the current status quo situation. The dynamics of forest fires and their implications to the development of carbon stocks should have been assessed.
- Mathematical formulas and algorithms are not adequate to develop credible scenarios.
- Use of terminology is inconsistent.

**Additionality**

- IRR models provide information on changes in carbon pools during the project period, but with the inadequate baseline definition the estimates are not reliable and have not been approved.
- Additionality tool by CDM EB has not been used.

**Leakage**

- The leakage due to project implementation activities (e.g. transport) are ignored.
- Consideration of positive leakage, which is against the rules of Decision 19/CP.9, is suggested.

**Environmental and social impacts**

- The reforestation project will have only positive environmental impacts.
- Social impacts have not been assessed.

**Box 4.2** Conformity of ARNM 0001, 0005, 0013 to CDM EB Criteria

#### **4.2.2 Reforestation Project Using Native Species around AES-Tiete Reservoirs, Brazil (ARNM 0002, 0012)**

The proposal for this project has been rejected once (ARNM 0002), but has been revised and resubmitted for approval. The last proposal (ARNM 0012) is under review by the A/R WG. Because of the similarity of the proposals the project is reviewed and evaluated only once in this report.

##### ***General description***

AES-Tiete is a energy company that operates 10 hydroelectric plants in the State of São Paulo. The objective of this project is to reforest areas surrounding the reservoirs of hydroelectric plants with native forest species. The project aims to preserve water catchment areas, develop biodiversity corridors in the reservoirs, and improve the quality of life of the local communities. The reservoirs are also important regional centers for tourism, fishing and aquatic sports.

The reforestation area is 4 188 hectares of which 500 hectares are planted annually. Reforestation will be finalized by the year 2014. There are no other known privately financed reforestation/afforestation projects that lead to forest protection areas underway in Brazil.

##### ***Baseline***

The project is eligible because the area was non-forested in 1989. The baseline is defined on the following assumptions:

- In the absence of the proposed reforestation project, the “AES-Tiete” areas will continue to be grassland and farm lands. Grassland and the crop fields will sequester vastly less atmospheric carbon than native forest ecosystem to be restored in the project, even when the leakages are taken into consideration
- Natural reforestation will not occur

Carbon pools monitored in the project include (i) above-ground biomass, (ii) dead wood, (iii) litter, (iv) below-ground biomass, and (v) soil organic carbon. Greenhouse gases included in the project are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O).

The CDM EB identified following deficiencies in the methods used to define the project baseline

- A steps-wise approach justifying the selection and determination of the most plausible baseline scenario is not provided.
- Methods to estimate carbon sequestration before and after project activities are not published and thus it is not possible to estimate the net anthropogenic GHG removal by the project activity.
- Methods to estimate biomass in the five different carbon pools are non-conservative, ill-defined, contain errors, are unsubstantiated, and are without references.
- The land use development for the project time period without any project activities is not identified, analysed and justified.
- CDM procedures for A/R projects are not respected in the definition and consideration of net GHG removals by sinks.
- CDM provisions are not respected in defining carbon pools in the project.

Baseline definition does not meet the CDM criteria

### ***Additionality***

- Investment analysis indicates that reforestation by planting is not economically feasible without CDM funding.
- No other income generation is foreseen for the area
- The reforested areas will be protected areas where no commercial logging is allowed. This ensures maintenance of carbon stocks in established forests.
- The PDD follows the structure of “Tool for the demonstration and assessment of additionality” with some modifications, which is considered a positive aspect.

The demonstration of additionality in this project is impossible due to the weaknesses in the determination of the baseline.

### ***Monitoring***

The monitoring methods are based on a standard yield measurement in plantation forestry that provides statistically reliable data on biomass in tree, shrub and grass layers on the selected carbon pools as well as on GHG emissions within the project area due to project activities.

The project participant describes in detail the formula and equations used in monitoring of carbon stocks. The planned calculation methods partly satisfy the criteria of the CDM EB.

### ***Leakage***

Leakage is inadequately addressed in the project PDD, which over-estimates the GHG sequestration achieved by the project activities. Description of leakage does not meet the CDM criteria.

### ***Environmental and social impacts***

The reforestation and establishment of a forest conservation area assures the protection of important fresh water resources, as well as aquatic and terrestrial ecosystems. The forest cover minimizes the impacts of environmental hazards such as storms and increased soil erosion.

Healthy ecosystems provide livelihood to local fishing communities and people engaged in ecotourism. The project will also contribute to the communities, generating employment and contributing to sustainable development in the region.

Description of the environmental and social impacts are very general in the PDD.

The conformity to the CDM criteria is summarized in Box 4.3.

**Eligibility**

- Historical and current land use data, GIS and satellite data prove that the area is eligible.

**Baseline**

- The baseline scenario is inadequate and does not describe the dynamics of site development if project is not implemented.
- Methods to define baseline are not transparent.

**Additionality**

- Assessment is adapted to the CDM EB standard tools and includes an investment and general barrier analysis.
- The investment would not be feasible without CDM funding.
- Due to deficiencies in baseline assessment, additionality cannot be defined.

**Monitoring**

- Monitoring methods are only partly transparent and justified.
- Fully credible data on the development of carbon stocks are not provided

**Leakage**

- Leakage is not assessed according to the CDM criteria.

**Environmental and social impacts**

- Environmental and social impacts are deemed positive but assessed at a very general level.

**Box 4.3** Conformity of ARNM 0002 to CDM EB Criteria**4.2.3 International Small Group and Tree Planting Program, Tanzania (ARNM 0003)**

The TIST Program empowers groups of subsistence farmers in Tanzania to restore local deforested areas and to adopt sustainable agricultural practices. Since its initiation in 1999, TIST groups have successfully planted over five million trees in Tanzania in order to accomplish GHG sequestration, create a potential long-term income stream, and to develop sustainable environments and livelihoods. Over 20 000 TIST participants in over 2 500 Small Groups are working on tree planting and tending.

The carbon sequestered by the planted trees creates a new ‘virtual’ cash crop to the participating local people. The TIST Pilot Program consists of two main components: the carbon sequestration “GHG credit” component and the sustainable development component.

The trees to be planted in the project will sequester 3.5 MM tons (CO<sub>2</sub> equivalent tons) by 2012. The proposed future activities are:

1. Planting a total of 5.75 million trees by 2 500 Small Groups (20 000 participants). These trees are planted specifically to sequester carbon and create greenhouse gas credits. The reforestation would not be feasible under any current economic or social activity. Reforestation is done according to UN FAO’s Conservation Farming Handbook.
2. Use of the Small Group network to encourage participation, develop local best practices, provide training, and obtain feedback.
3. Establish legal structures to aid in the sale of GHG credits.
4. Quantification and monitoring of tree planting, growth, species, and health.

### ***Baseline***

- The TIST Baseline Study demonstrates with evidence and observations by the government, stakeholders, and project participants that deforestation and soil degradation is a historical and ongoing problem in the project area. TIST adopts a baseline approach that assumes no additional degradation of the area. In fact, the degradation continues, which makes the baseline conservative.
- The proposed methodology does not include a baseline scenario that represents the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the proposed CDM reforestation project activity.
- The project brings the benefits of carbon market to smallholders in developing countries. As such, it has traded certain rigors in baseline analysis for ease of entry by these smallholders. However, while the rigors may have been lessened, each decision has been made so that the carbon quantified for this A/R CDM project activity is less than what is actually removed by the associated sinks.

Carbon pools included in the project are (i) above ground biomass, and (ii) below ground biomass. Carbon stocks in litter, dead wood and soil organic carbon are deemed to remain stable regardless of implementation of project activities.

The reforestation activities were launched after the January 1, 2000 and thus met the provisions of the Kyoto Protocol as the project was submitted for approval before the year 2006.

### ***Monitoring***

TIST requires from its participants and quantifiers a high level of transparency and uniformity in reporting and in quantification of tree stocks. GPS-specific data is provided by TIST quantifiers in order to ensure that third party verification or reported data is possible long after trees are planted.

The method for calculating sequestered carbon is done by age class and species. The yield estimates rely on forest inventory data and allometric equations.

### ***Additionality***

Additionality is not addressed in a proper way in the PDD. The concept of additionality is not thoroughly understood and the description lacks any method for the assessment of additionality (e.g., investment and barrier analysis are missing).

A test for pre-screening should be included if the CDM-ARNMB is to allow a starting date going back to 2000.

An appropriate additionality tool should be developed to address these issues.

### ***Leakage***

TIST recognises two types of leakage outside the project boundary: (i) transportation of project staff, and (ii) using of dead trees in plantation forests as fuelwood. Currently fuelwood is collected from living trees. Dead wood is not included in the carbon stock calculations with the result that their use is beneficial for the carbon balance compared to the current situation.

The project participants' descriptions of the leakage do not conform to the CDM criteria:

- assessment is incomplete and does not include potential leakage from agricultural activities.

- The CDM process does not recognise the concept of beneficial leakage and all sources of leakage should be considered as sources of GHG emissions.

### ***Environmental impacts***

The TIST project will have a number of environmental benefits (e.g., on soil and water protection, improved ground water reservoirs, biodiversity protection and decrease in environmental damages of grazing and fuelwood collection).

In addition, fruit and nut production decrease the pressure for slash and burn agriculture.

### ***Socio-economic impacts***

The project will create a multiple positive socio-economic impact through increased wood and food resources, improved technologies (ovens, crafts) and various incentives for divers economic activities (banking services, micro loans, support for divers production).

#### **Eligibility**

- No reliable data available on the state of the project area in 1989.

#### **Baseline**

- Baseline describes only the current situation and does not provide a dynamic scenario on the future development without project activities.
- Baseline is general and information on estimation methods are not published.
- Definition of baseline does not meet the CDM criteria.

#### **Additionality**

- Additionality is not fully understood and the description does not meet the CDM criteria.

#### **Monitoring**

- Monitoring methods seem to be very general and based on reporting of inventory data by managers of the forest plots.
- Information on formula or algorithms is not given.

#### **Leakage**

- Leakage is not assessed according to the CDM criteria.

#### **Environmental and social impacts**

- The project will not have significant negative impacts.

### **Box 4.4** Conformity of ARNM 0003 to CDM EB Criteria

#### **4.2.4 “Treinta y Tres” Afforestation Combined with Livestock Intensification, Uruguay (ARNM0004)**

##### ***General***

The project aims at reducing GHG emissions in combination with livestock and pasture management and reforestation. Beef and sheep industries are the major source of GHG emissions in Uruguay. Cattle production in Uruguay is based on extensive grazing of low-quality pasture, a system with very low inputs and very low productivity.

The project area will cover a total of 18 973 ha of land currently under extensive grazing by beef cattle, producing a total of less than 900 t of meat or its equivalent per year. A fraction of the land, including the most fertile soils, will be used to implement a semi-intensive animal production system



that would result in a reduction of methane emissions per unit of animal product. In order to avoid leakage, a restriction to maintain the same level of production as in the baseline scenario will be imposed.

The land released from livestock production will be used to establish forest plantations for obtaining high-value, long-lived timber products and for sequestering large amounts of carbon dioxide from the atmosphere. Projected use of land will be as follows:

- Forest plantation 10 000 ha
- Improved pastures 4 100 ha (grazing)
- Native grassland (grazed) 2 700 ha (grazing)
- Protected native forest, etc. 2 173 ha

The afforestation component will be based on *Eucalyptus grandis* plantations with 20-year rotations. Plantation establishment will be completed during a five-year project and forests will be replanted after clear-cut harvest. An Environmental Management System will be implemented and practices will be compatible with FSC (or similar) standard for forest management.

The project will have several sources of climate benefits: (a) reduction of methane emissions from enteric fermentation; (b) carbon sequestration by planted forests; (c) carbon sequestration in soils by seeding legume forages; and (d) carbon sequestration by protection of natural forests and creation of protected areas. Only carbon sink category (b) above will be included as an A/R CDM project activity.

### ***Baseline***

The proposed baseline alternatives are:

1. The continuation of the extensive cattle grazing with no pasture improvements
2. Continuation of the cattle grazing with pasture improvement on one-third of the land area
3. Conversion to cropland
4. Afforestation for pulpwood purposes

The project monitors and reports the carbon pools in (i) above ground biomass, (ii) below ground biomass, (iii) litter, (iv) deadwood, and (v) soil organic carbon.

The A/R WG identified the following deficiencies in the baseline definition:

- All non-tree carbon pools in the project scenario are considered only in qualitative terms, without either direct estimations or a direct justification of magnitude, as required to make the methodology transparent and conservative (required as per modalities and procedures for CDM A/R project activities (decision 19CP 9) (see section B.I.(5).c).
- The changes in carbon stocks for the baseline and the project scenario are not considered for separate individual carbon pools which is required as per the modalities and procedures for CDM A/R project activities (decision 19CP 9) (see section B.I.(5).c).

### ***Monitoring***

The *Ibirá Methodology* was developed for monitoring carbon stock changes and greenhouse gas emissions in project activities of afforestation on grassland sites combined with livestock intensification. The references to livestock grazing are restricted to estimation of leakage. For

this reason, the methodology could be easily adopted for any other project activity involving afforestation with homogeneous tree plantations.

The proposed methodology is very comprehensive, covering all five carbon pools for both forest land and grassland, as well as four main sources of greenhouse gas emissions from implementation of project activity. It also covers two possible sources of leakage (emissions due to displacement of livestock from project area, and to possible induction of native forest harvest nearby the project area). In addition, it provides an appendix, which is not an integral part of the methodology, with a simple-decay procedure for estimating carbon stocks in harvested wood products which can be considered as an additional carbon pool.

All equations for estimating carbon stock changes, greenhouse gas emissions and leakage, are presented following a step-wise approach, beginning with general equations and following with more detailed calculation of the different parameters. The methodology for estimating carbon stock changes in forest pools is largely based on conventional forest inventory practice, thus greatly facilitating its application in a wide range of situations. All methods are relatively simple, and minimize the use of default values, which tends to increase the accuracy of the estimations. The methodology is fully compatible with *UNFCCC Modalities and Procedures for A/R CDM Project Activities*, and with *IPCC Good Practice Guidance for LULUCF*. The methodology also encourages, wherever applicable, the development of project-specific models, allometric equations, and emission/C-stock-change factors.

The CDM EB gave the following remarks on the proposed *Ibirá Methodology*:

- The methodology provides an elaborated procedure to compare baseline and project activity
- The changes in carbon stocks are not considered for separate individual carbon pools
- Non-tree carbon pools in the project scenario are considered only in qualitative terms

### ***Additionality***

Financial analysis of land alternatives using IRR are included in the *Ibirá Methodology*. The analysis of land use alternatives were performed for an area equivalent to the one proposed by the project activity (18 973 ha, of which 10 000 ha were considered for afforestation alternatives). It was assumed that investors could either be the current owners of the land, or any other. The value of land was assumed to be the same as for the project activity, and the project duration for the land use alternatives analyzed was assumed to be 30 years.

### ***Leakage***

Afforestation within project boundaries is expected to cause some GHG emissions due to burning of fossil fuels, use of nitrogen fertilizers, biomass burning, and road construction. Also, CO<sub>2</sub> emissions will occur during the time of site preparation due to the decay of grassland biomass. The projected average annual increase in forest carbon pools, chiefly tree aboveground biomass, will be much higher than those emissions, resulting in a net GHG removal.

In addition, due to the fact that the project was designed to produce thick, knot-free sawlogs, a large fraction of the carbon to be sequestered will remain locked in long-lived wood products. According to UNFCCC's Modalities and Procedures for A/R CDM Projects, harvested wood products is not an eligible pool and all wood products removed from the area within project boundaries are assumed to oxidize in the year of harvest. This does not reflect reality, since decay of wood products occurs over a period of several years, and for this reason, net GHG removals by "Treinta y Tres" project sinks will be underestimated by as much as 40%.

The A/R WG identified the following deficiencies related to the leakage description:

- The criteria and procedures to assess magnitude of the identified potential leakages are incomplete. Two sources of leakages are considered: a) leakage associated with non-CO<sub>2</sub> GHG emissions from displaced livestock from inside to the outside of the project area, b) leakage associated with the displacement of timber usage from native forest from the inside to the outside of the project area.
- The equations provided are for total biomass stock in native forest (Mg.ha-1) and annual animal weight gain in the baseline (kg product. ha-1.yr-1), which are not sufficient to estimate or ascertain leakage.

### ***Environmental and social impacts***

The project was estimated not to have remarkable environmental or social impacts, although significant afforestation will change the ecosystem structure in the area.

#### **Eligibility**

- The PDD does not include evidence that the project area was non-forested in 1989. However, this is fairly obvious taking into consideration the ecosystem and past land use in the area.

#### **Baseline**

- Baseline is fairly systematically defined for alternative land-use forms.
- Quantitative estimates for changes in carbon pools, especially non-wood pools, are inadequate in view of CDM criteria.

#### **Additionality**

- The important assumptions related to additionality is adequate.

#### **Monitoring**

- Monitoring methods are well described and linked with modalities of IPCC and UNFCCC.
- Monitoring should provide more sophisticated quantitative information on changes in carbon stocks in all selected pools.

#### **Leakage**

- Procedures to assess leakages are incomplete and equations used do not produce sufficient data.

#### **Environmental and social impacts**

- The project will likely not have significant positive or negative impacts.

### **Box 4.5** Conformity of ARNM 0004 to CDM EB Criteria

#### **4.2.5 Bagepalli CDM Afforestation Programme, India (AR0006)**

##### ***General***

The aim of the project is to encourage marginal farmers and local government bodies to take up afforestation on small plots (0.25 ha to 1 ha). The total project area is 1 383 ha. Afforestation would benefit local communities on government land and marginal farmers managing their private farmland. The objective is also to create a long-term income for marginal farmers and other labour.

### ***Baseline***

The baseline methodology for afforestation/reforestation on degraded lands is used. However it does not provide a dynamic estimate of the impacts of land-use alternatives on carbon pools without CDM project activities.

A/R WG comments on the baseline description:

- Given that the baseline methodology should model the verifiable net removals of a project *ex ante*, the current methodology is not applicable. The CDM-AR-NMB outlines sampling strategies for both the quantification of the baseline and the actual GHG removals by sinks
- The baseline methodology should be described in an internally consistent and unambiguous way following a logical order; short descriptions of methodological steps should contain all relevant steps, which are described in more detail later in the text; terminology should be unambiguous. This is not the case and a thorough revision of the entire document is needed to set users in a position to use the CDM-NMB in a ‘cookbook’ manner.

### ***Monitoring***

The simplified methodology adopted for the Bagepalli CDM afforestation project, which is a small scale project, simplifies the monitoring methodology in three ways:

- The project boundaries are dynamic to allow for buffer.
- The baseline is static and there is no monitoring
- There is no monitoring for leakages

### ***Additionality***

An additionality study is part of the baseline and methodological study.

### ***Leakage***

No leakages are defined.

### ***Environmental impacts***

The project will ameliorate the dry and erosion prone area and to reduce pressure on water resources by introducing perennial endemic fruit trees that need much less water than annual arable crops.

### ***Socio-economic impacts***

This project will be of particular benefit to families because they will have a secure wage income in the form of payments from the project CERs for a thirty-year period. Without this income they would not be able to take up afforestation and reforestation activity. After 10-12 years they will also have income from sale of fruit. They will have fuel and fodder for cooking and cattle, and in the long term the water table will rise – this will provide more secure sources of drinking water and water for domestic and agricultural use.

**Eligibility**

- The project eligibility is not proven.

**Baseline**

- The PDD does not include dynamic baseline assessment that would provide quantified information.

**Additionality**

- Additionality is not addressed although reference to “Tool for the demonstration and assessment of additionality” is made.

**Monitoring**

- Simplified monitoring methodology.

**Leakage**

- Risks for leakages are not assessed.

**Environmental and social impacts**

- Project is estimated to have significant positive impacts.

**Box 4.6** Conformity of ARNM 0006 to CDM EB Criteria**4.2.6 Moldova Soil Conservation Project (ARNM 0007)****General**

Soil erosion and landslides have major economic and environmental implications for land use in the Republic of Moldova. Degraded lands can only permit low intensity grazing. Due to lack of investments in the restoration of degraded lands, public and community lands have undergone significant decline in their productivity due to physical erosion, uncontrolled grazing, and other unsustainable land use practices. If no suitable measures are implemented to arrest these adverse physical and anthropogenic influences, the lands may degrade further and continue to be the sources of GHG emissions from soil and vegetation pools.

The project has multiple objectives in terms of the restoration of degraded public lands, improvement of forest product supplies to local communities, and contribution to the GHG removals through improvement of carbon pools in the degraded lands. The project area of 14 494 ha is distributed throughout the country.

The project is expected to generate revenue from the sale of timber from thinning and harvest and CERs from improved GHG removals over a 20-year crediting period, which is renewable for two consecutive 20-year periods for a total project period of 60 years.

**Baseline**

The baseline approach on **existing or historic carbon stocks, as applicable**, is relevant to the project context. This baseline approach highlights the factors contributing to historic or existing land use in the absence of interventions and is relevant to the project for the following reasons:

1. Historical and existing patterns of the land use in Moldova highlight the demands on land use and the resulting loss of productivity during last several decades.

2. The past and present national and sector policies in Moldova have not provided for fiscal and other incentives to stakeholders for restoring the degraded lands.
3. Degraded lands have been traditionally used for fuelwood collection and grazing. However, inability of the government and public agencies such as Moldsilva to invest in the restoration of degraded lands led to the continuation of past land uses.
4. Data on afforestation/reforestation for the period 1994-2001 shows that the average annual area afforested is 663 ha. Financial resources are not likely to be available for the restoration of degraded lands. Therefore, it is reasonable to assume that historic afforestation/reforestation trend will continue in the absence of the project.

Considering the lack of mandatory policies for the restoration of degraded lands, the public and communal lands are likely to degrade further and affect the local ecology and economy. In the absence of specific interventions to address the soil erosion and landslides that spread to adjoining lands, the likelihood of natural regeneration through succession processes appears remote.

The stakeholder consultations indicate that the control of landslides is the most important natural resource management issue in Moldova, and keeping degraded lands under grazing will lead to further loss of carbon pools. If delayed further, the rehabilitation of these lands may not be technically and financially feasible in future.

The baseline approach also notes the long experience of Moldsilva (the state forest agency) in the management of country's forests and its technically qualified staff to collect relevant data at specified intervals, to monitor the carbon pools, and to implement the monitoring plan.

The methodology presents a step-wise approach to the assessment of land use and the carbon pools associated with land use. It selects the appropriate baseline approach and criteria that best characterize the land use, helps to outline the characteristics of plausible land uses in the project context, and identifies the alternative that conservatively reflects the baseline scenario.

The restoration of degraded lands through afforestation is possible in the presence of suitable incentives, which may help to meet the demand for fuelwood, timber, and non-timber products, and promote the expansion of carbon pools.

The analysis of the baseline highlights the continuation of existing land use and is the one that most closely reflects the baseline. Since land degradation is a long-term process that has significant historical significance, it highlights the evolving land use over time, and relates the existing land use with the past land use.

Financial constraints limit alternative land-use options in the foreseeable future. So the only realistic land-use option that can be expected without the project is continued unsustainable land use and further increase in soil erosion, which may lead to eventual abandonment of degraded lands and can result in adverse impacts on adjacent lands, water, and communities with clearly negative and consequential impacts in the medium to long-term.

The financial and economic cost-benefit analysis used to compare the without- and with-project situation provides a quantitative assessment of the baseline scenario. Additional information from household surveys, ecological assessments, land capability classification, field studies on land use pattern, and the experience of Moldsilva and local councils that oversee the management of public and community lands is considered in assessing the baseline scenario.

### ***Monitoring***

The monitoring methodology for carbon pools within the project boundary outlines methods for selection of representative sample frame and sampling methods. The methodology proposes to monitor *above-ground* and *soil carbon pools*.

The major components of the methodology are:

***Vegetation monitoring.*** The methodology proposes to cover tree, non-tree (shrub/herb), deadwood, and litter pools. Degraded lands have poor vegetation and in general it is assumed that no further vegetation development will take place. As part of monitoring process, neighbouring sites shall be observed during normal site inspections to evaluate the likely changes in the vegetation of the baseline scenario.

***Soil monitoring.*** The soil monitoring shall track changes in soil organic matter and soil erosion on selected project sites. The plots within the project boundary and adjoining to project boundary are selected to evaluate the likely changes in soil carbon. Soil samples (particle size < 2mm) are collected to a depth of 30 cm. The net carbon accumulation per plot and rates of carbon accumulation shall be estimated to achieve desired precision in the estimation of soil carbon pools.

***Monitoring socio-economic factors and biodiversity.*** Since the degraded lands are influenced by socio-economic variables, this methodology also recommends monitoring socio-economic factors influencing the land use, in addition to monitoring the carbon pools in vegetation and soil. The biodiversity of the area also provides information on the quality of vegetation carbon pool.

This monitoring methodology accepts that the net GHG removals by sinks in the baseline scenario are set to zero for the degraded lands that are covered by the baseline methodology. The baseline shall be reviewed at the end of the 20-year period, which coincides with the crediting period. A reassessment of the net GHG removals in the baseline scenario may have to be undertaken before the crediting period can be renewed. The monitoring data can be used to update the CO<sub>2</sub>FIX model so that the projected carbon pools are updated at each monitoring intervals based on actual field data.

To ensure that the monitoring frequency adequately represents the changes in the carbon pools, periodic assessment through field visits shall be undertaken.

For annual reporting purposes, projections from CO<sub>2</sub>Fix model are used to estimate the annual changes in carbon stocks at five-year intervals.

### ***Additionality***

***Investment Analysis.*** The investment analysis of the project is conducted covering both financial and economic analyses.

Sensitivity analysis is made to examine the influence of variables such as timber prices, project cost, and carbon price. An increase in timber price has positive influence on the afforestation investment. Any change in labour costs can also have an impact on project performance.

The increase in economic attractiveness occurs due to cost reductions in terms of prevented offsite impacts of soil erosion, carbon removals, and increased community benefits. The results of economic analysis show that carbon values are critical for the project. If carbon value and prevented soil erosion values are not taken into account, the project continues to have negative present value.

The outcomes of financial and economic analysis underlines the significance of this project and justifies it from the perspectives of environmental and community benefits. The project meets in general the criteria of financial and economic additionality.

**Barrier Analysis.** In the context of degraded lands, the barriers illustrated below are relevant to the project:

1. Investment barriers
  - The upfront investment associated with the project activity is high and is concentrated in the early phase of the project, whereas benefits from the project start only after five years in the form of thinning revenue or revenue from non-timber products.
2. Barriers due to prevailing practices
  - Most degraded lands are under the control of public agencies or local councils. These lands reflect the properties of common pool resources. Weak institutions and lack of regulation on the use of degraded lands lead to unsustainable land use and increase the risk of land degradation. Therefore, lack of institutional arrangements and legally enforceable measures are major barriers in restoring the degraded lands.
3. Technical/operational barriers
  - The afforestation of degraded lands requires sound silvicultural practices and trained personnel to raise successful plantations.
  - Lack of awareness on the environmental impact of soil erosion and prevailing information barriers may inhibit the local communities to actively participate in the management of degraded lands.

### ***Leakage***

The methodology considers two forms of leakage: 1) staff travel associated with the project activity and 2) diversion of pre-existing A/R activities.

### ***Environmental impacts***

The project will reduce severe forms of erosion. It will regenerate the soil profile and improve soil organic accumulation and mitigate the impacts of the landslides. The productivity of adjoining agricultural lands is expected to increase over medium to long term.

The afforestation will result in enhanced floral diversity through planting of native species which is expected to increase the habitat diversity.

### ***Socio-economic impacts***

The project is expected to reduce landslides and improve productivity of communal lands. It will ensure the supply of fuelwood, timber, non-timber products, and employment opportunities to local communities. In the long run, additional benefits may result from tourism and recreation. The project will improve the management of communal lands and promote sustainable rural livelihoods.

Compensation of stakeholders and economic incentives, legal and institutional issues, and capacity and technical assistance are expected to further enhance the project impacts and serve as mitigation measures to address implementation issues.



A/R Working Group is considering recommending the project.

#### **Eligibility**

- The project eligibility is proven with historical forest management data.

#### **Baseline**

- Alternative land-use forms, which provided objective arguments for the chosen baseline on the continuation of the current degrading land-use forms, were systematically identified and analysed.
- Baseline assessment also reviewed the applicant organizations' competence to carry out the required project activities (e.g., afforestation, carbon stock monitoring).
- Project scenario was chosen among the most feasible alternative land-use scenarios.
- Carbon pools monitored included above ground and soil carbon pools.

#### **Additionality**

- Investment analysis indicated that project activities (afforestation) will not be implemented without incentives from CDM funding.
- Investment analysis, including sensitivity analysis, was done following systematic methodology, including cost-benefit analysis.
- Barrier analysis identified investment barriers (high initial investments, only long-term returns), institutional barriers (weak local institutions, lack of legislation), and technical barriers (lack of awareness on the environmental impact of soil erosion and methods to prevent it).
- Provided evidence indicates that, apart from the project scenario, there is no alternative feasible land use form that would contribute to carbon removals by sinks, showing the project proposal met the additionality criteria.

#### **Monitoring**

- Monitoring is based on structured methodology for baseline evaluation and on the assessment of carbon pools and changes in them.
- Monitoring methods are explained in a transparent way.

#### **Leakage**

- Leakages are defined

#### **Environmental and social impacts**

- Positive environmental and social impacts are presented to provide necessary basis for project activities. The objective has not been to justify any shortcomings (e.g., additionality criteria with positive environmental and social impacts), which has been case in many other projects.

### **Box 4.7** Conformity of ARNM 0007 to CDM EB Criteria

#### **4.2.7 Kikonda Forest Reserve Reforestation Project, Uganda (ARNM0008)**

##### ***General***

The Kikonda Forest Reserve Reforestation Project aims at reforestation of bush, grassland and degraded woodland in the Kikonda Forest Reserve in Uganda. The total project area is 8 354 ha.

Charcoal burning and cattle grazing during various decades have steadily reduced the woodland and the natural forest. These activities are illegal with respect to Ugandan law. Global-woods AG (g-w) started the reforestation activities in 2002 with the planting of *Pinus caribaea* and the native species, *Maesopsis eminii*, on areas that have not been covered by forest for the last twenty years.

By contract with the Ugandan Government and through a compulsory management plan, g-w is obliged to set up a forest plantation in the reserve and to bring an end to cattle grazing and illegal

charcoal burning. G-w is aware of the fact that cattle and charcoal burning form a part of the life of local communities and migrating cattle herding tribes. To address these needs, g-w runs programs that promote the sustainable production of charcoal and sustainable ways of keeping cattle.

The specific purposes of the Kikonda project are: (i) sequestration of CO<sub>2</sub>, (ii) conservation of biodiversity and improving the economic value of the remaining natural forest and woodland through ecological reconstruction (enrichment planting) employing suitable native tree species, (iii) sustainable production of high value and general purpose sawn timber by planting and tending conifer and broad leaved fast growing tree species, and (iv) utilize existing biomass (and those to come out of new planting) resources to produce energy in the form of charcoal and wood chips.

### ***Baseline***

In the degraded areas, afforestation or reforestation are the only legal land use options. Nevertheless, activities like charcoal burning and cattle grazing have been conducted until today in an unsustainable way and have degraded the area. It is expected that past land use activities will continue to be conducted in the future due to missing economic alternatives for local people; therefore, the baseline carbon stocks will decline in the future with no baseline GHG removals by sinks to occur.

Out of the tree baseline approaches, **existing or historical changes in carbon stocks in the carbon pools within the project boundary** is the appropriate approach for the project area. There is an evident risk that if illegal charcoal burners and cattle keepers are excluded from the forest reserve they will evade to other areas. Due to lack of alternatives it is likely that they will go on with these activities. It is therefore proposed that these people be incorporated into the project activity to prevent these leakage effects from occurring.

Alternative *predictions* of future land-uses are to be determined by people familiar with the current political and socio-economic situation in the country. Cattle-grazing and charcoal burning are therefore regarded as alternatives to the proposed CDM activities, although they do not comply with all applicable legal and regulatory requirements.

The area and distribution of vegetation types, measured in 1999, were used to determine if the areas proposed for afforestation or reforestation are *eligible* for CDM.. The measurement is backed by an analysis based on 2001 satellite images taken by g-w and the Institute for Remote Sensing at the University of Freiburg. Starting in June 2005, g-w is planning to reaffirm the area eligibility by analyzing the vegetation cover by means of satellite images of 1989, 1995 and 2001. According to the analysis of past and present land use activities, it is expected that the degrading activities will continue in the future; therefore, the project areas are not considered as temporarily unstocked and they are not expected to revert to forest.

### ***Monitoring***

The methodology proposes to monitor only the above- and below-ground tree biomass since it includes the option that the baseline carbon stocks will decline and the baseline net GHG removals by sinks are set to zero. The actual net GHG removals by sinks will be derived by stratification of the area according to the tree species and/or age classes of the species used. By establishing permanent sample plots, verification of the actual net GHG removals by sinks will be conducted every five years.

### ***Additionality***

To conduct an *investment* analysis, financial indicators such as IRR, NPV, cost benefit ratio, or unit costs of service and its alternatives must be compared. In the case of the Kikonda Forest Reserve, it is necessary to determine such indicators from cattle-grazing and charcoal burning activities. For these

operations no such data are available because charcoal is sold on an informal market where prices and conditions are not transparent. Investment comparison analysis is therefore not applied. G-w therefore chooses to apply benchmark analysis.

A reforestation project in general holds substantial risks for the investor. Growth rates, natural hazards, and wood prices are hard to predict. Due to long production cycles, returns are generated only after several years. Eastern Africa as an investment region carries additional risks. Political and legal instability are significant hurdles for attracting investment. To compensate for the risks, investors demand returns of at least 10%. Furthermore, g-w's experience has been that the risk factors mentioned above make it impossible to receive credits for such projects.

An alternative to the proposed reforestation activities would be cattle keeping and charcoal burning. As explained earlier, this activity is illegal, but common. No significant investment is needed to run this kind of business. Barriers to the proposed reforestation activity do not hinder the cattle-keeping and charcoal-burning alternatives.

The project cannot receive financing or subsidies from government sources due to its large scale and other barriers. No other comparable projects providing reference have been carried out in Uganda.

For several years the NFA has been searching for investors to set up plantations inside the National Forest Reserves. Due to the low expected rate of return, success has been very limited. The National Forest Reserves have not been reforested so far due to a lack of capital from the investors side. Now the NFA is offering support in identifying National Forest Reserves as sites for A/R-CDM projects, hoping that revenues from CDM funding will compensate the investor for low returns from wood sales.

A/R WG remarks on the additionality:

- The projected CDM activity faces the problem of generating a low IRR if the income is generated from wood sales only. In this case, g-w expects an IRR of 7.63%. Taking into account existing alternative investments with a risk much lower than for reforestation projects, it would not be possible to generate financial means to implement the project. Carbon revenues will allow g-w to generate the financial means to run the project.
- If the proposed CDM activities are put into practice, the current land-use activities are not continued. The proposed CDM project activity is therefore not the baseline scenario and can be considered to meet the additionality criteria.

### ***Leakage***

Emissions associated with travel activities from project staff (by cars, airplane) as well as transportation of sawlogs to the customers and markets are considered as leakage and will therefore be monitored and documented annually. Leakage effects could be caused by biomass use (e.g., cattle grazing, charcoal burning, fuel wood collection) by people moving outside the project boundary.

### ***Environmental impacts***

National Environment Management Authority (NEMA), requested by global-woods, has mentioned no objection to the proposed reforestation project activity. There are positive environmental impacts of the reforestation:

- Reduction of soil erosion
- Increasing water storage capacity and water quality
- Contribution to climatic amelioration through carbon sequestration.

An environmental monitoring program will be launched before the project implementation.

### ***Socio-economic impacts***

The A/R CDM project will have significant socio-economic impacts in and outside the project boundaries. Depending on the season, g-w employs between 50 and 100 workers. Preferably people from the neighbouring villages will be employed to improve the contact and communication between g-w and the local people. As demand in labour at times exceeds the supply, people from other parts of the country are hired, with a focus on troubled Northern Uganda. Today, three different eastern African languages are spoken among the g-w workforce, giving an impression that cultural heterogeneity is in place. It is the intention of g-w to promote and facilitate intra-cultural communication amongst the workforce in order to serve as a role model for peaceful cooperation.

#### **Eligibility**

- The forest cover has been very low in the region, previous inventories and satellite images provide evidence on long term degradation.
- The project eligibility is not proven but this is planned via satellite images.

#### **Baseline**

- No procedure is provided for transparent justification of the key hypothesis in baseline assessment
- Increased transparency on procedures for baseline definition is required.
- Pre-project carbon stocks are not assessed.
- Non-CO2 emissions from the project activity are not considered.

#### **Additionality**

- Assessment of additionality is not adapted to the local conditions.
- No tools for uncertainty assessment to ensure a conservative approach.

#### **Monitoring**

- Baseline monitoring is not addressed at all.
- Terminology defined by UNFCCC or CDM are not used which causes confusion.

#### **Leakage**

- Leakage for potential activity shifting out of project area is not addressed.

#### **Environmental and social impacts**

- Project is estimated to have significant positive impacts.

**Box 4.8** Conformity of ARNM 0008 to CDM EB Criteria

#### **4.2.8 Rio Aquidaban Reforestation Project, Paraguay (ARNM0009)**

##### ***General***

The project objective is to increase afforestation of bush and grassland in the ranch “Rio Aquidaban” in Paraguay. The total afforestation area is 580 ha out of a total of 650 ha land area. The project area is degraded pasture land.

The poor soils of the project area only allow reforestation or further extensive cattle grazing. Since the local people cannot afford investments into reforestation, the past land use on the project area is expected to continue. If grazing is not stopped, the remaining forest will be quickly destroyed. An alternative, agricultural use of the land, is not possible as the soil is too poor to support the growth of crops. Attempts to use land in the Aquidaban region for tourist projects have failed.

The specific purposes of the Rio Aquidaban Reforestation project are: (a) sequestration of CO<sub>2</sub>, (b) conservation of biodiversity and improving the economic value of the remaining natural forest and woodland through ecological reconstruction (enrichment planting) employing suitable native tree species, (c) sustainable production of high value and general purpose sawn timber by planting and tending conifer and broad leaved fast growing tree species, and (d) utilization of the existing biomass resources to produce energy in the form of charcoal and wood chips. The plantation will be managed with 20-year rotation with regular intermediate cuttings.

The project conforms with overall State forest policy and strategy which identifies degraded woodlands, bushes and grasslands for afforestation. The reforestation project at Rio Aquidaban started in March/April 2000.

##### ***Baseline***

The proposed baseline methodology was developed for areas that have been subject to land clearing and cattle grazing for several decades. The methodology considers the baseline approach of *existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary*, as it relates to continued cattle grazing, to be appropriate. The degradation of the area would continue and the carbon stocks decrease continuously.

##### ***Monitoring***

The proposed monitoring methodology was developed for afforestation/reforestation of areas that have been degraded through land clearing and cattle grazing. The methodology is suitable for project areas where these land uses are expected to continue without implementation of the project.

The only carbon stocks to be monitored are *above* and *below-ground* carbon stocks. Dead wood, litter and soil organic carbon are excluded since they are not expected to increase in the baseline scenario and are not expected to decrease in the project scenario. Due to few alternatives for the local people, it is expected that extensive cattle grazing will continue.

There will be no monitoring of baseline net GHG removals by sinks since the baseline carbon stocks are expected to decline and the baseline GHG removals by sinks are set to zero. The actual net GHG removals by sinks will be derived by stratification of the area according to the tree species and/or age classes of the species used. By establishing permanent sample plots, verification of the actual net GHG removals by sinks will be conducted every five years.

### ***Additionality***

To conduct an investment comparison analysis, financial indicators such as IRR, NPV, cost benefit ratio or unit costs of service most suitable for the project type and decision-making context of the CDM-project and its alternatives have to be compared. On the baseline assessment it would be necessary to determine such indicators from cattle grazing; **however, reliable data are not available for these activities.**

A crucial factor that must be considered is that A/R-CDM projects carry significant risks. Natural hazards such as fire or drought can decrease the timber volume output. Because the tree species used in RA have never been planted before in the area, the predicted growth cannot be taken as a fact. The development of prices for ICERs is difficult to predict and investors' trust in ICER markets is limited.

Based on company experiences, it is impossible to attract any foreign investment in a long-term project in Paraguay if the return is below 20%. From these points it can be concluded that the CDM project at Rio Aquidaban is financially less attractive than alternatives available for local and international investors. The financial attractiveness of an A/R-CDM project can be increased both by changes in the profitability of the project itself and on the other side by a decrease of the profitability of the alternatives used as benchmarks.

The profitability of the A/R-CDM project can be improved by:

- A decrease in production costs
- An increase in timber sales prices
- An increase in production volume (growth rate)

The sensitivity analysis supports the assumption that the proposed CDM project activity at RA reserve is unlikely to be the most financially attractive. Although the sensitivity analysis has proven that the A/R project activity is financially less attractive than alternative investments, a barrier analysis is undertaken to support the additionality of the project.

The projected CDM activity faces the problem of generating a low IRR if the income is generated from wood sales only. In this case, an IRR of 8.0% is expected. Taking into account existing alternative investments with a risk much lower than that occurring in reforestation projects, it would not be possible to generate financial means to implement the project.

Contrary to the neighbouring countries Brazil and Argentina, plantation forestry has not been a success in Paraguay so far. Lack of qualified personnel, bureaucratic obstacles, poor infrastructure, and an underdeveloped sector for wood processing antagonize investors. The few trials to establish forest plantations in the past have not been successful.

There are no other ongoing activities similar to the project proposed.

### ***Leakage***

Emissions associated with travel activities from project staff (by cars, airplane) as well as transportation of sawlogs to the customers and markets outside the project boundary are considered as leakage and will therefore be monitored and documented annually.

***Environmental impacts***

No negative impacts are identified; however, afforestation may increase the fire risk in the area.

***Socio-economic impacts***

No negative socio-economic impacts are identified with the implementation of the project activity. The reforestation project employs former cattle keepers who now receive a payment.

**Eligibility**

- Afforestation was initiated in March 2000, which is recognized time period for CDM A/R projects.
- No evidence that the area was non-forested in 1989, although reference to long-term grazing is given.

**Baseline**

- Definition of degraded is not given.
- Evidence that continued grazing is the most probable land use form is not represented.
- Information on the methods to assess the GHG balance is not fully transparent and detailed.
- Carbon pools are defined as appropriate.

**Additionality**

- Cattle farming and A/R activities without the revenues of the CDM as baseline alternatives should be included as scenarios to be tested.
- Barriers are merely economic, although reference is made to other barriers.
- There is no indication as to how the CDM project could resolve the barriers.

**Monitoring**

- Monitoring methods are presented in a very general way.

**Leakage**

- Leakage (e.g., from cattle grazing and fencing outside the project boundary) is not addressed.

**Environmental and social impacts**

- Project has positive environmental impacts if fire risk is minimized.
- Afforestation provides employment on new sectors that do not degrade environment as does traditional cattle-keeping.

**Box 4.9** Conformity of ARNM 0009 to CDM EB Criteria**4.2.9 Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin, China (ARNM0010)**

The proposed A/R CDM project activity, Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin, China, will be implemented under the Guangxi Integrated Forestry Development and Conservation Project (GIFDCP) that addresses the closely inter-linked threats to Guangxi's natural forests, watersheds, and biodiversity through an integrated landscape level approach.

The proposed A/R CDM project activity aims at reducing threats to local forests and generating income to farmers by enabling the carbon sequestered by plantations to act as a "virtual" cash crop through the sale of carbon credits. Plantation wood will, in turn, reduce the harvesting pressure on natural forests.

The specific objectives include:

1. To sequester CO<sub>2</sub> through forest restoration in small watershed areas and test how reforestation activities generate emission reductions that can be measured, monitored and certified.
2. To enhance biodiversity conservation by increasing the connectivity of forests adjacent to nature reserves.
3. To improve soil and water erosion control.
4. To generate income for local communities.

To achieve the objectives, the following A/R CDM project activities are proposed:

1. Establishing 2 000 ha of multiple-use forests in Huanjiang County of Guangxi with mixed species
2. Establishing 2 000 ha of multiple-use forests with adapted species on sites with severe soil and water erosion in Cangwu County of Guangxi.
3. Establishing legal structures to aid the sale of Certified Emission Reductions (CERs), test carbon purchase transactions, and accumulate experience in practical and technical measures for A/R CDM project activities
4. Monitoring and assessing the project's environmental and socio-economic impacts.
5. Developing and testing local financing mechanisms for watershed management and degraded land restoration.
6. Developing, testing and disseminating the best practice in watershed management and strengthening capacity building through support for training and technical assistance to the relevant agencies and communities.

Without the additional income from the carbon credits, reforestation in the project areas is not economically feasible. With the sales of carbon credits and additional income from managing the reforested lands as multiple-use plantations, the proposed A/R CDM project activity can provide benefits to local farmers and communities that range from direct income supplements to broader social and environmental benefits.

Planting activities will start in 2006. Tree species will be planted in mixed species arrangements to minimize fire and health risks and to maximize environmental and social benefits.

### ***Baseline***

The project areas were forested lands in the 1950s. However, the areas suffered several large-scale deforestation events since then, mainly caused by unreasonable policies.

The baseline approach, **existing or historical changes in carbon stocks in the carbon pools within the project boundary**, is the most appropriate choice for determination of the baseline scenario. The field surveys and interviews with stakeholders indicated that the only realistic and credible alternative available to the project participants is to continue the current degrading land use due to the economic unattractiveness as well as the barriers in finance, technique, and institutions' and market risk related to afforestation.

Most lands are currently covered by grass and shrub, except one 44 ha piece of land with a few growing trees. Natural regeneration of the area has not succeeded due to lack of seed sources and failure of seeding activities.

Due to the low soil fertility of the degraded land, agricultural land use, commercial timber plantations, and other land uses are economically unattractive. Although both national and regional



governments have set an overall development goal for forestry development in the project region, financial, technical and institutional barriers do exist to prevent any efficient activities reach the goal.

### ***Monitoring***

The carbon stock changes in the baseline scenario are set to zero for lands without growing trees and the carbon pools monitored include *above-* and *below-ground* biomass for reforested lands.

### ***Additionality***

The steps outlined in the Additionality tool are followed to demonstrate that the proposed A/R CDM project activity is additional and not the baseline scenario. Both investment and barrier analysis are used.

***Investment analysis.*** The benchmark analysis assesses the economic benefits from timber harvest and resin production under the project scenario with no economic benefits provided in the baseline.

The PIN Financial Analysis spreadsheet developed by the World Bank BioCarbon Fund is used to conduct the investment analysis in which Financial Internal Rate of Return (FIRR) with and without the carbon benefit is the indicator. When carbon finance was excluded, the FIRR was significantly below the benchmark, so that the proposed A/R CDM project activity is not financially attractive in absence of the sale of ICERs.

Sensitivity analysis was also carried out.

### ***Barrier analysis***

#### a) Investment barriers

- It is hardly possible for local people to afford the high establishment investment in the early stage because all incomes from timber, non-wood products and ICERs may occur five years after the start of the proposed A/R CDM project activity.
- The chances to get commercial loans from banks for the purpose of reforestation activities are very low. Only with the proposed A/R CDM project activity will local farmers take World Bank loan for reforestation on the degraded land and will the Chinese Government commit counterpart funding. Local, short-term loans can also be available in this case.

#### b) Technological barriers:

- Interviews with local communities indicates that local farmers are usually short of access to quality seed sources and lack skills for producing high quality seedlings and for successful tree planting, as well as for preventing planted trees from being subject to fire, pest and disease attack.

- c) Institutional barriers:
- Individual farmers do not have the resources to manage the reforestation activities or face the technological barriers.
- d) Market risks:
- Wood grooving in remote degraded regions involves high risks, whereas the price per unit of CER is guaranteed in the proposed A/R CDM project activity by means of a contract with the World Bank BioCarbon Fund. This provides stable incomes. The project participants see the proposed A/R CDM project activity as a “testing ground” for carbon finance business, which further increases their interest to go ahead with the proposed A/R CDM project activity. Without the sale of CER, the basic financial considerations and the risk awareness cited above would drive the decision not to go ahead with the project.

### ***Leakage***

Leakage due to vehicle use for transportation staff, labour, seedlings, timber and non-forest products as a result of the proposed A/R CDM project activity

### ***Environmental impacts***

By establishing 4 000 ha of multiple-use forests on lands close to and between nature reserves that suffer from severe soil erosion, the proposed activities will increase forest cover of project towns/townships and provide the following additional local environmental benefits.

- Enhancing biodiversity and ecosystem integrity.
- Providing firewood for the community, thus reducing the pressure of firewood collection on the reserves and increasing biodiversity conservation.
- Generating increased income to local communities from the proposed A/R CDM project activity. This will reduce their tendency to degrade biodiversity through practices such as poaching, forest fires, illegal logging, and NTFP collection in the nature reserve. These activities are key threats to the nature reserve management and to wildlife management in the nature reserves.
- Controlling soil erosion.
- Improving soil and water protection and stabilizing local climate.
- Providing incentives for people to invest in sustainable land use.
- Improving watershed management and contributing to ecosystem improvement along the Pearl River through demonstration and extension of the project experience to other areas.

No risk and/or negative impact is considered to be significant.

### ***Socio-economic impacts***

Socio-economical impacts are not analysed.

The A/R Working Group has recommended preliminary approval of the project.

#### **Eligibility**

- The degraded land area has been practically deforested since 1989. The Project activities have not yet started.

#### **Baseline**

- Continuation of existing or historical land uses and resulting changes in carbon stocks into the future.
- Land degradation will continue without project activities and no carbon removals will be developed (e.g., through natural regeneration).

#### **Additionality**

- The steps outlined in the additionality tool are followed.
- Investment and sensitivity analysis indicate that project is economically attractive and exceeds the Chinese government benchmarks for FIRR only if CDM funding is available.
- Barrier analysis recognized a number of investment, institutional, and technological barriers and market risks that would prevent similar reforestation activity without CDM funding.

#### **Monitoring**

- Pools monitored included above and below-ground carbon pools.
- Monitoring tools were adapted to the local conditions based on interviews and local knowledge.
- Changes in carbon stocks were monitored by sinks within the project boundary.

#### **Leakage**

- Leakages are defined as appropriate.

#### **Environmental and social impacts**

- Potential positive environmental impacts of reforestation on biodiversity and soil and water protection were analysed in detail.
- Socio-economic impacts were not analysed, although project objectives included involvement of local people in the activities.

### **Box 4.10** Conformity of ARNM 0010 to CDM EB Criteria

#### **4.2.10 Chocó-Manabí Corridor Reforestation and Conservation Carbon Project, Ecuador (ARNM0011)**

Reforestation will take place on two sites within the Chocó-Manabí ecoregion of Ecuador. A total of 523 ha will be reforested at sites on the western foothills and coastal plains of Ecuador.

The coastal forests of Ecuador are among the most threatened in the world, with roughly two-thirds already gone. Reforestation will preserve remaining forest fragments and improve ecological benefits. Although these plantations will be comprised of a diverse mix of native tree species, over time the structural and microclimatic conditions created by the forest plantations will allow a broader selection of native plant and animal species to enrich the plantations through dispersal from neighbouring primary and secondary forests. These forest plantation areas will be maintained for the long term, with no harvesting of wood products foreseen.

Acute deforestation in areas surrounding both sites has strengthened local awareness and concern about the social and ecological values of forests. It is hoped that reforestation at these sites will serve as a platform for much broader reforestation efforts in surrounding communities in the future.

### ***Baseline***

Baseline is designed to be a generic baseline methodology applicable to many other projects. The identification of baseline land use alternatives is as follows for the two strata:

***Maquipucuna.*** When the Maquipucuna Foundation acquired the project area some 15 years ago the land was used for growing sugarcane (15 ha) and extensive cattle ranching (343 ha).

Since Maquipucuna gained title to the project area, the following developments took place: (a) the 15 ha of sugarcane were reduced to 10 ha; (b) the 75 ha of pasture was taken out of production and converted into a shrubland; and (c) the remaining 260 ha of pasture were maintained as pastures by renting them to caretakers of the Maquipucuna reserve and their families to graze their family's cattle. The three candidate baseline land uses in Maquipucuna are thus sugarcane—cultivation pastures, active pastures, and abandoned pastures.

***La Perla.*** Mrs. Susan Sheppard acquired the 650 ha of the La Perla site that were covered with abundant, primary forests. In 1960-70s, legislation forced her to deforest a minimum of 70% of the area. This left only 260 ha of forest standing. The deforested lands were turned into pastures with cattle and portions covered with banana, oil palm, and other annual crops.

The candidate baseline land uses in La Perla are thus pastures—oil palm plantations, banana plantations, and natural regeneration.

The areas to be reforested are not of direct importance to the Maquipucuna Foundation and the Susan Sheppard Ecological Foundation for subsistence or general well being. Both foundations have reforestation of these areas as a primary objective. The current income-generating activities are easily ceased.

Only employees of the Foundations are using the areas as their primary income. These people will remain employed by the Foundations. The chance that they will deforest elsewhere to compensate for their loss of employment is considered negligible.

### ***Additionality***

The Project is a reforestation project. It is deemed to be additional due to financial barriers: an investment is made without any projected other returns but ICERs. The additionality tool is not used. Parts of it are included in the baseline.

### ***Leakage***

The project will not generate any products that need to be transported to markets. The only expected emissions are from transportation of personnel.

### ***Environmental and socio-economic impacts***

The project, in principle, should have no negative environmental impacts. The project aims to replace exotic pasture land with highly diverse plantations of native tree species. These will be maintained for at least thirty years without any harvest and should serve to buffer, connect, and expand adjacent patches of neighbouring forest.

The project developers have conducted a preliminary review of the project's environmental and social impacts during this project design phase based on the "Community, Conservation and Biodiversity Project Design Standards" (Climate, Community and Biodiversity Alliance, 2005). These standards are the product of an ongoing peer-reviewed process to develop a quantifiable mean for identifying projects with clear, verifiable triple benefits for climate, local communities and biodiversity conservation.

**Eligibility**

- Satellite data confirm that the area is eligible.

**Baseline**

- The formulae for the baseline are based on the initial carbon content of all pools and flow-based extrapolations, while the methodology relies on the measurement of the separate carbon pools. It is not defined how these two should be made commensurable.

**Additionality**

- Additionality test and baseline determination should be clearly separated.

**Monitoring**

- Description of the integration of pool-based model into the flow-based model is not given.

**Leakage**

- Leakage from cattle grazing and fencing is not addressed.

**Environmental and social impacts**

- Project has no negative environmental or socio-economical impacts.
- Community, Conservation and Biodiversity Project Design Standards are used.

**Box 4.11** Conformity of ARNM 0011 to CDM EB Criteria**4.3 LESSONS LEARNED REGARDING PROJECT ACCEPTANCE UNDER CURRENT CDM A/R INTERPRETATIONS**

The CDM Executive Board provides clear guidance on eligibility and additionality. The fundamental and most important task of the project participants is to demonstrate that “the actual net greenhouse gas removals by sinks are increased above the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the registered CDM afforestation or reforestation project activity” (CDM EB 21 Report, Annex 16).

The key to the above task is a properly defined baseline scenario. Many projects that have been rejected by CDM EB have failed in this. It is vital to use scientific or economic analyses to project what might happen in the project boundary in the future with no project activities. All relevant baseline options must be fully explored.

Also additionality must receive careful attention. The additionality tool provided by the CDM Executive Board should be used to perform a rigorous assessment of the proposed project. It will be critical to demonstrate that the project without CDM financing is not financially attractive, or that there are barriers to the project that are removed by CDM financing. The fact is that the most profitable land use will never fulfill the requirements for additionality.

A good, complete and conservative inventory methodology must also be provided. The inventory methodology can also be adequately referenced if an appropriate methodology already exists with full guidance as to its use and justification of expansion factors.

Some projects have also failed in providing a conservative methodology to establish project eligibility with respect to the proposed land area being non-forest land in 1990 and to the boundary of the project.

All data must be as transparent as possible. Data sources must be thoroughly documented. Any expert opinion used must be backed by appropriate documentation establishing the credibility of such experts.

The projects that have been successful so far [Moldova (ARNM 0007) and China (ARNM 0010)] are model examples of the PDD well done.

## **5.0 CONCEPT FOR AN INDUSTRIAL CDM A/R PROJECT UNDER CURRENT CDM CRITERIA CONSTRAINTS**

### **5.1 ASSUMPTIONS AND CRITICAL FACTORS**

It is assumed that NCASI is primarily interested in plantations that are productive and established with commercial seedling material suitable in particular for pulp and paper production. The review of proposed CDM A/R projects has revealed that the most critical factors for a successful project are:

- Well developed baseline methodology
- Demonstration of additionality achieved due to the project

Our proposal for the concept CDM A/R project pays special attention to the above two factors. The proposal does not strictly follow the defined structure of PDD, since the emphasis is on tackling the additionality provision that lays the foundation for other necessary project components.

### **5.2 PROJECT CONCEPT**

Tree plantations located near a mill provide wood raw material at a competitive cost/price for industrial purposes. Plantations outside a certain radius from the mill are not attractive raw material sources because of high transportation costs and other expenses. With the benefits from CDM project, however, the mill is able expand its production capacity and wood procurement area (Figure 5.1 and Figure 5.2).

The economic wood procurement area without CDM incentives (inner circle of Figure 5.1) is determined to fulfill 100% of the mill's wood need at the capacity level A. The need for lands to be occupied by plantations depends on the production capacity of plantations and wood demand of the mill.

If the economic wood procurement area is expanded with the help of CDM incentives (outer circle of Figure 5.1), the production capacity of the mill can be increased to the level that the wood procurement area B is able to provide raw materials for industrial processing. It is also assumed that the mill cannot establish new plantations in the procurement area A to satisfy the wood needs of the expanded production capacity (e.g. governmental/municipal restrictions regarding the maximum area of tree plantations or lack of suitable sites for plantations).

In addition to the plantations with the purpose of producing industrial wood raw material, the project concept is recommended to include forest stands aimed at enhancing biodiversity and restoring natural forest formations in the region. The restored natural forests will not be harvested and therefore the carbon sequestered in them can be entirely brought in the tradable Certified Emission Reductions (CERs).

The proposed concept also draws on participation of the local community in the ownership and management of the planted areas. A separately agreed share of the plantations is recommended to consist of private tree farms that are technically and financially supported by the project developer.

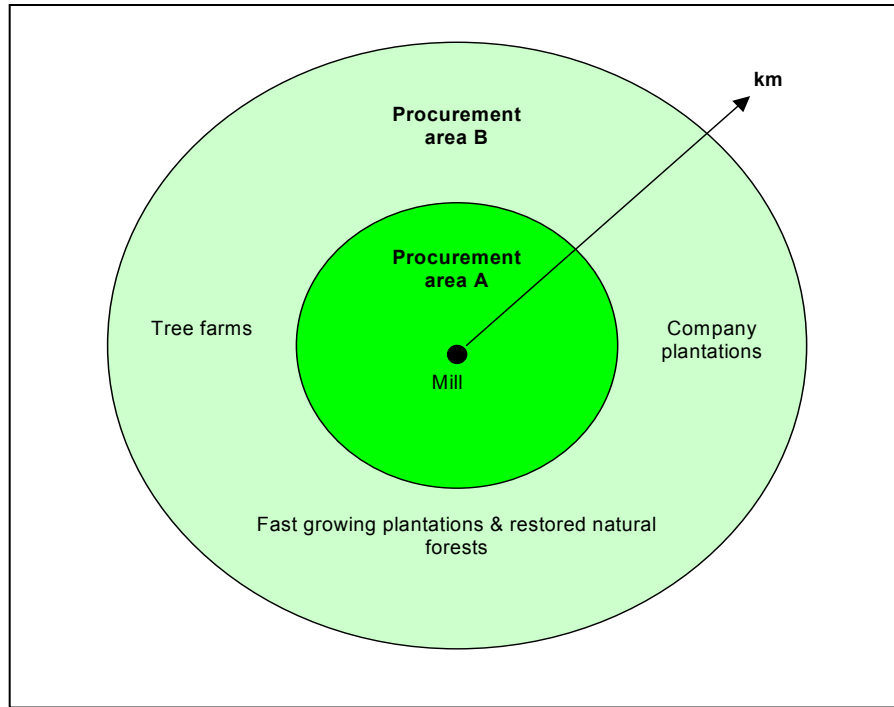


Figure 5.1 Illustration of the Project

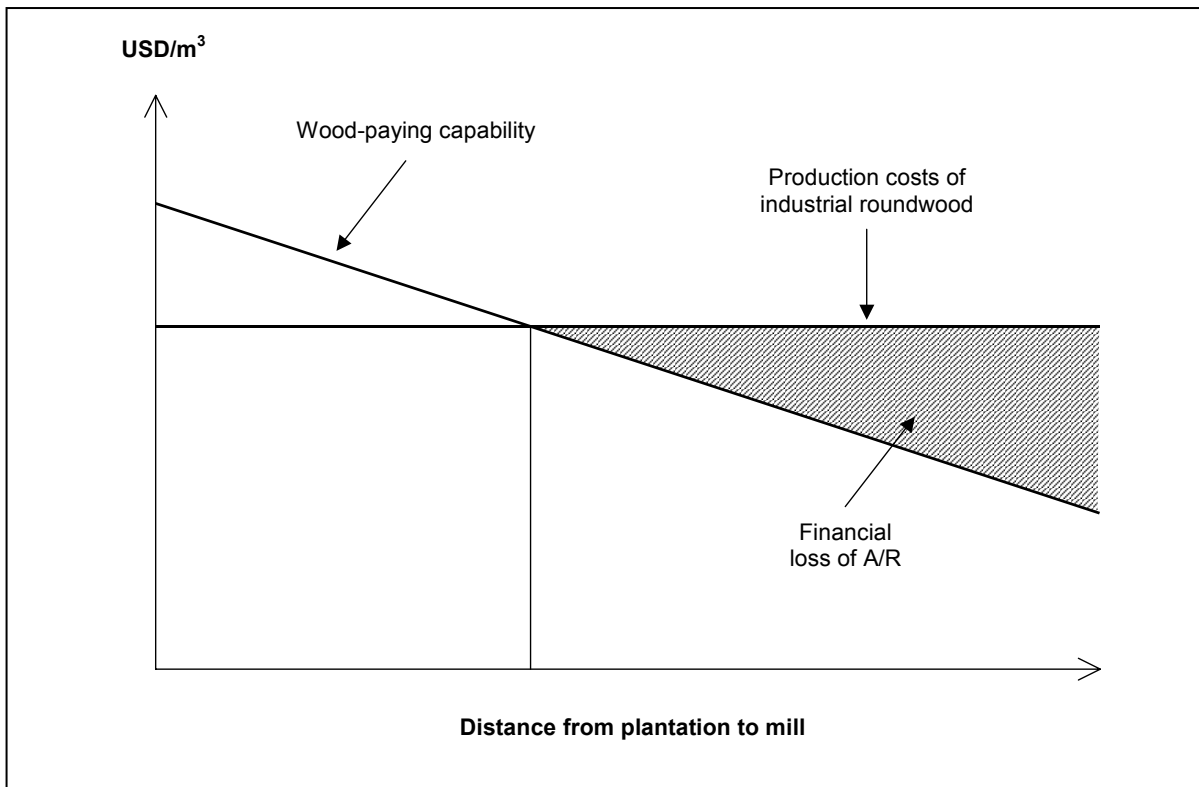


Figure 5.2 Wood Paying Capability

The baseline, additionality, environmental and social development components and other relevant factors of the project are discussed in Sections 5.3-5.8.

In regard to the selection of carbon pools, Savcor Indufor recommends that (i) above-ground biomass and (ii) below-ground biomass will be used to estimate changes in carbon stocks. The exclusion of litter, dead wood, and soil organic carbon is justified by more complex quantification methods that would need to be developed. The exclusion of these components in the context of afforestation or reforestation of open lands would not increase the net GHG removals by the sinks.

### **5.3 BASELINE**

#### **5.3.1 Baseline Approach**

The baseline scenario is defined to foresee the changes in carbon stocks in the project area without the application of CDM A/R modality. The optional baselines for the imagined A/R project are:

- The present land use will continue
- The present land use will change

The latter option shall be applied if there are identified pressures on the project area to change the land use form. The project developer shall also provide evidence that the proposed A/R activities would not have been implemented without the availability of CDM benefits (CERs).

#### **5.3.2 Appropriate Baseline Cases**

The project sites to be afforested/reforested are recommended to consist of abandoned agricultural fields, pastures, or other areas that are currently not in active use. The development of the sites without the A/R project shall be forecasted based on historical data of the area or equivalent conditions. Special attention shall be paid to the possibilities of natural reforestation. If natural reforestation is likely, the carbon stocks of naturally regenerated forests need to be incorporated into the baseline scenario. The baseline scenario should also address any adverse development processes (e.g., fires or [illegal] logging activities) that at certain intervals may result in carbon stock losses.

It would be beneficial to the A/R project if the host country were not experienced in industrial tree plantations. This starting point would allow the use of the argument “first of its kind”, which is an exploitable impediment type under the barriers due to prevailing practice (Tool for Demonstration and Assessment of Additionality in A/R CDM Project Activities and Section 5.4).

The sites, which are not used by the local communities or others, minimize the risks of negative leakage outside the project boundary (Section 5.5). Savcor Indufor also recommends that the project developer avoid competition on land areas with alternative new use forms.

### **5.4 ADDITIONALITY**

The project’s additionality will be demonstrated by *investment analysis* and by *barrier analysis*. The Tool for Demonstration and Assessment of Additionality in A/R CDM Project Activities allows the stand-alone analysis (either investment analysis or barrier analysis), but because the most successful proposals (Moldova and China) have applied both alternatives, the consultant recommends the same approach.

The financial feasibility will be assessed based on cash flow calculations over the crediting period of the investment. The following indicators will be used to prove the non-commerciality of the project without the benefits from the CDM:



- Internal Rate of Return
- Net Present Value
- Other appropriate financial indicators
- Relevant benchmark information
- Sensitivity analysis

The long distance between the plantations and the industrial site for wood processing is the main argument to support the financial non-viability of the A/R project. The voluntary restitution of natural forest formations also increases the costs of the A/R project but does not bring about other revenues than assumed CDM credits.

The barrier analysis will complement the investment analysis to prove the non-feasibility of the A/R project without the expected CDM incentives. The project developer applies the barrier analysis to demonstrate that there are impediments that would prevent the implementation of the proposed A/R activities (and to show that the identified barriers would **not** prevent the implementation of at least one of the baseline alternatives).

Since the barriers are always specific to the country/region, they need to be identified case-by-case. (Barriers are always closely interlinked with the baseline scenarios.) At least the following barrier types could be relevant to the industrial plantation projects:

- Investment barriers (e.g., funding mechanisms are lacking in the country)
- Institutional barriers (e.g., high political risks, inadequate legislation or low level law enforcement)
- Lack of infrastructure
- No similar experience (the project is the “first of the kind” in the host country)
- Barriers relating to markets, transport and storage
- Remoteness of A/R activities and undeveloped road and infrastructure incur large transportation expenditures, thus eroding the competitiveness and profitability of timber and timber products from the CDM activity
- Lack of skilled and/or properly trained labor force (including tree farmers)
- Lack of organization of local communities

Other barriers, e.g., those related to ecological or social conditions, can be applicable to certain project environment.

## 5.5 LEAKAGE

Leakage is not considered a serious threat to the acceptability of a plantation project that is based on A/R of open areas. Within the boundaries of the project area, construction of infrastructure (e.g. roads and bridges), mechanized plantation management and harvesting operations, transportation of wood to the mill, and industrial processing of wood result in GHG emissions. These emissions have to be taken into account when calculating the net average amount of CO<sub>2</sub> sequestered in the plantations and restored natural forests (Figure 5.4); however, they are not leakage as per the definition of “Leakage for A/R Project Activities.”

The leakage outside the boundaries of the project is brought about by activities that result from the project. (Illegal) conversion of forests to agricultural fields or for cattle grazing when the previous land users have moved to new areas to maintain their conventional means of livelihoods could be an example of leakage. This type of leakage can be avoided by choosing abandoned lands for the A/R activities.

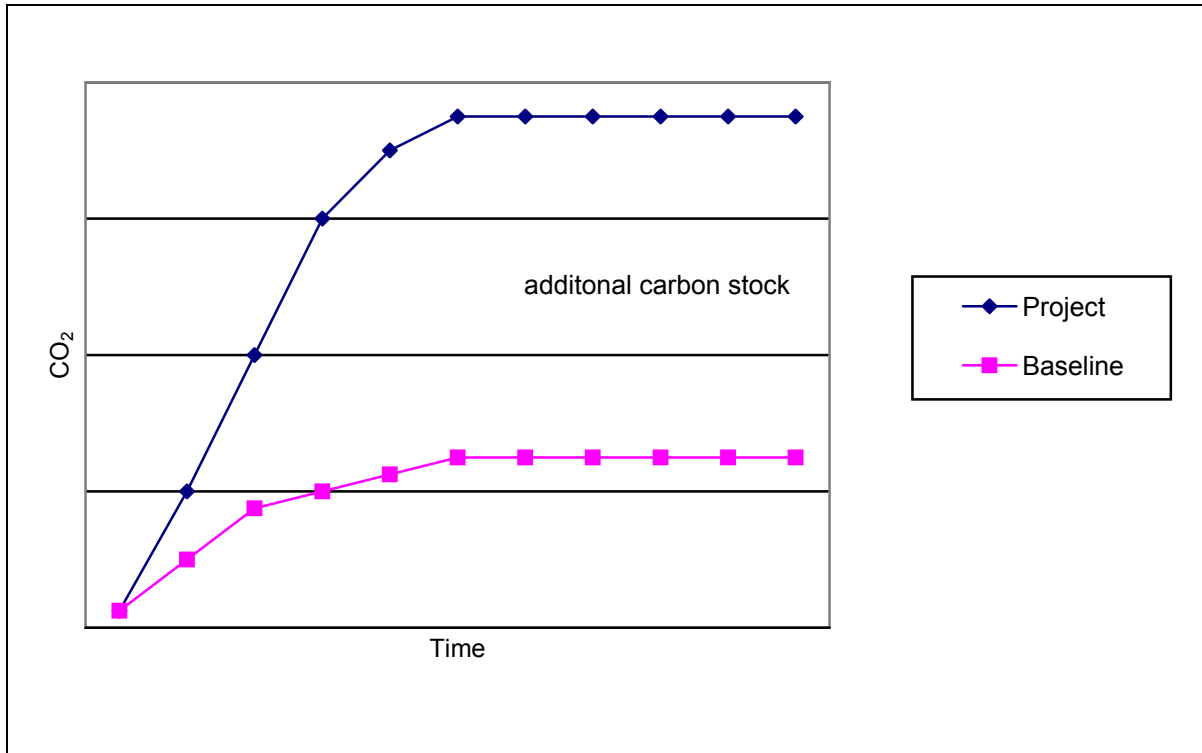


Figure 5.3 Additional Carbon Stock

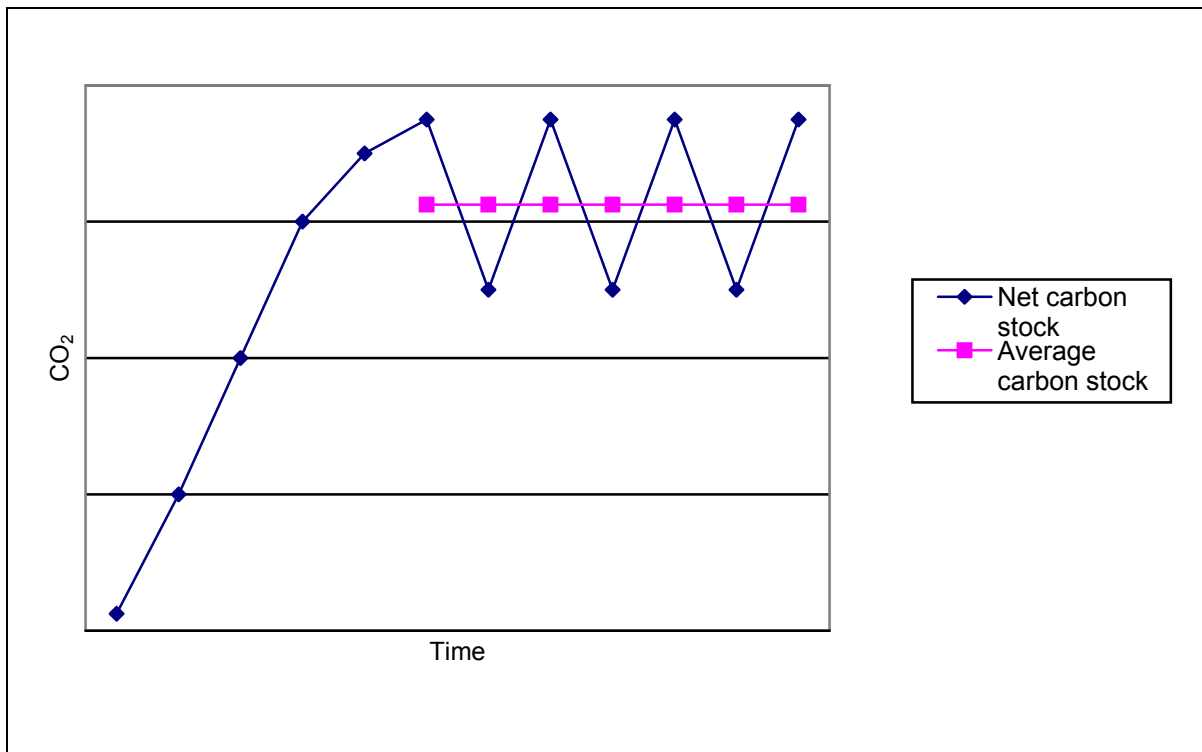


Figure 5.4 Development of Net Carbon Stock

## 5.6 CARBON STOCK CALCULATION

The net sink will be calculated as the difference between the carbon stock of the project and that of the baseline scenario. The development of net carbon stock is characterized by volume increment of growing stock and cuttings at the end of rotation (Figure 5.4).

The development of average growing stock will be altered to carbon dioxide with the help of appropriate conversion factors. The conversion factors to be applied may include the following:

- Commercial wood volume to whole tree volume
- Whole tree volume to dry biomass
- Dry biomass to carbon content
- Carbon content to carbon dioxide

The monitoring of carbon stocks sequestered in the plantations will be based on the development of the growing stock. Commonly applied forest inventory methods, including pre-harvesting measurement of plantations, will be used for assessing the wood volumes available for cuttings. Sample measurements in various development phases of the planted areas can be employed to verify the conditions and volume growth of tree stands.

## 5.7 ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT

If the additionality provision is met by a project, a crucial step is to demonstrate that the environmental and social impacts are assessed and necessary measures are introduced for the mitigation of the significantly negative ones. It is a basic rule that all acceptable CDM projects shall be environmentally and socially attractive.

Industrial plantations are commonly criticized because they create monocultures. In order to maintain and enhance the biodiversity in the project area, the plantations shall:

- not exceed a specifically agreed share of the land area by municipalities or equivalent administrative units
- be established with more than one tree species, where deemed possible
- be established with non-invasive tree species
- include natural forest formations (e.g., rehabilitation of degraded forests)
- be composed of mosaic formation, where wood production plantations are interspersed with natural forests that are not used for wood production (e.g., steep slopes, valleys and wetlands are reforested with natural local tree species)
- surround threatened natural forests (e.g., to avoid risks related to illegal logging)

The productive plantations and natural forests included in the project can also be effective means to stabilize the soil in erosion prone areas and protect watercourse (e.g., rivers, brooks and lakes) against silting and eutrophication.

Industrial plantations require efficient management measures to fully utilize their wood production capacity. The measures may include soil-disturbing site preparation and the use of fertilizers and pesticides/herbicides. Adequate control measures need to be developed to mitigate adverse environmental impacts.

Industrial plantations are subject to criticism because their employment effect and other constructive socio-economic impacts can be at a relatively low level. The social acceptability of industrial plantations and project's general attractiveness can be increased by:

- involving local land owners as contracted growers and suppliers of wood. In particular, involvement of smallholders provides a large number of persons with job opportunities and would improve the overall image of the project.
- integrating community-based land ownership or use rights in the project's wood production system, if such communal schemes prevail in the project area.
- implementing a social development program appropriate to the socio-economic conditions of region concerned. The program may include elements such as improvement of the infrastructure and provision of basic education and training.

The involvement of local population in the wood production system of the project requires intensive support to contracted landowners and tenants. The involved persons may need to be provided with seedling materials and advised in various phases of the plantation management cycle.

### **5.8 SELECTION OF HOST COUNTRY**

The basic requirement is that the host country has to be a non-Annex B country with a national designated authority to implement and control the Kyoto Protocol and potential CDM projects. If the proposed project is in accordance with the CDM requirements, there are no country-level restrictions for the approval of projects. However, the national and international stakeholders, especially NGOs, can strongly oppose approvals of A/R activities for CDM projects. Brazil, a country with several pilot A/R projects, has already faced tough resistance to use forest plantations as carbon sinks and as sources of marketable carbon credits.

Countries with positive attitudes towards industrial fast growing plantations and active programs to support A/R activities can easily turn out to be ineligible to CDM sink projects because of difficulties in meeting the additionality provision.

Mozambique could be an interesting host country for an A/R project, even though it currently lacks the national designated CDM authority. Mozambique has carried out surveys on areas appropriate to plantations forestry and has political will to develop the private forest sector of the country. Furthermore, projects aiming at economic development in African countries may meet less national and international opposition than A/R projects in Latin America or South East Asia.

### **6.0 SPECIFIC RISK RELATED TO ACCEPTABILITY OF INDUSTRIAL CDM A/R PROJECT**

The risk that CDM A/R methodologies for industrial fast growing plantations are considered non-acceptable is relatively high. Industrial A/R activities are generally opposed because they are commonly considered financially attractive and thus unable to meet the additionality provision of CDM projects. Therefore, it is crucial that the project developer is prepared for criticism and able to provide credible evidence on the additionality of the proposed A/R project.

It is also worth mentioning that not even significant environmental and social benefits from a plantation project can cover up deficiencies in the achievement of the additionality provision. If the additionality cannot be demonstrated convincingly, the CDM EB cannot approve the proposed methodology.